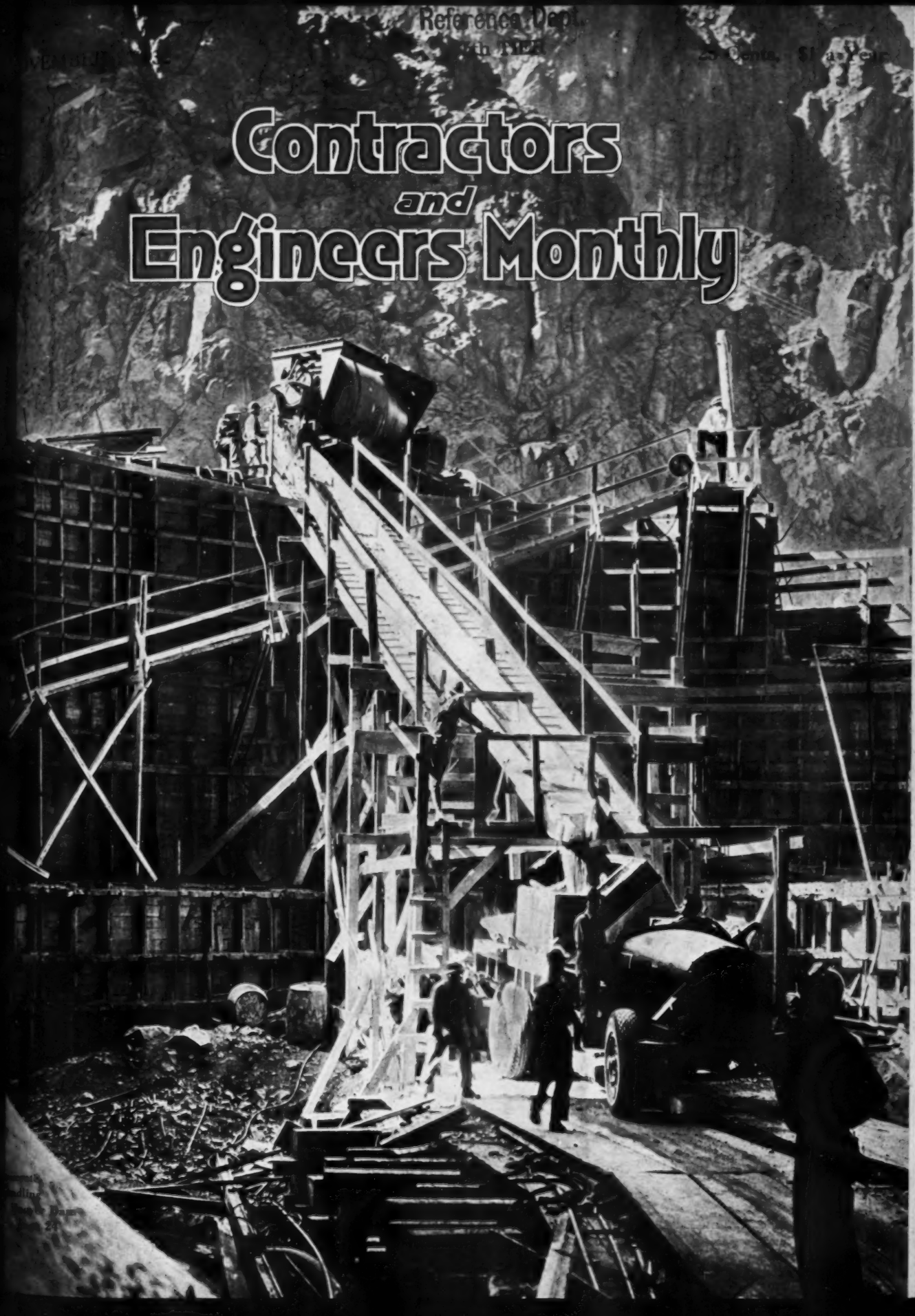
25 Cents. $1 a Year.

Contractors and Engineers Monthly



Attention *to* Details Makes Job Run Smoothly

Central States Contracting Co. Ran Tandem Pavers and Used Every Means to Insure Continuous Production

IT was not the contractor who insured the comfort of the workers on the job between Jackson and Fairmont, Minn., during the hottest weather, and both before and after, by furnishing near beer and pop along the grade, but the wife of one of the truck drivers who augmented his income with a thriving business in refreshments. A Nash sedan was equipped with an ice box in place of the rear seat and ice cold drinks were dispensed all day until it was time to drive back to town and prepare the evening meal. Other details far more important to the continuous operation of the job were looked after most diligently by the Superintendent and his foremen.

A tool box carried on the finisher's bridge contained a plane to make correction of the drag straight-edges a matter of seconds instead of minutes. It also contained extra gloves, a hack saw to cut a piece of reinforcing bar that did not fit into a certain location at a bridge or elsewhere, pipe fittings, wrenches, a saw, and many other tools that it is well to have handy in case of emergency. The two Ord finishing machines were covered with sheet metal housings all the time to protect the machinery, and the operators were given one-half hour overtime each day to clean and grease the machines so that they would be ready for maximum production the following day. At night two men greased the machinery by the light of two gasoline lamps, and these men also watched and lighted the bomb torches at all barricades to prevent accidents from careless drivers. One of these men worked twelve hours and the other four hours one night and then reversed the time the following night to get in their eight hours.

The question of time was handled in an unusual manner by this organization. According to the 1931 labor regulations, paving organizations could work only forty-eight hours a week, but to overcome this check on production and yet to enter into the spirit of the law which was aimed to increase employment, the Central States Contracting Co. worked three shifts with its tandem pavers. This does not mean that the work was continued for twenty-four hours a day, for the paving operations were continued only from six in the morning until six-thirty at night. At six in the morning one shift came on and quit work at ten, and then returned at two-thirty and worked until six-thirty making its eight hours. Another group came on also at six in the morning and worked right through until two-thirty with the half-hour lunch period making its eight hours in one stretch. The third group came on at ten in the morning and worked until six-thirty at night, making its eight hours in one stretch. By this method there were continuous additions of fresh, rested men coming into the work ready to maintain the production at the maximum. The foremen and the timekeeper had a difficult time until they were personally well-acquainted with the men but they all agreed that the scheme worked admirably to get production, and that is the aim of any paving job.

Another set of handy boxes to carry tools and small pieces of equipment and materials was found on the No. 2 Ord and the pavers. The No. 2 Ord carried a box painted a good neutral gray with all the greasing equipment for all machines. Thus, centrally located, it

was ready for the night greasers without getting out separate guns for the different machines. A rack on No. 2 paver carried all the odds and ends of dowels neatly packed away where they would not interfere with any of the workmen. The No. 1 paver carried a large gray box which slid under the platform like a drawer in which all the paver tools were kept with the tools for the night men who handled the moving of water pipe and valves. The trailer pulled by No. 2 finisher and carrying the cutter for the center dummy joint was built unusually strong. This machine was loaded first on a large truck when moving equipment from one section to another and was strong enough to carry the entire set of bridges piled on it to make one compact truck load.

STATIONARY TRAPS FOR BULK CEMENT

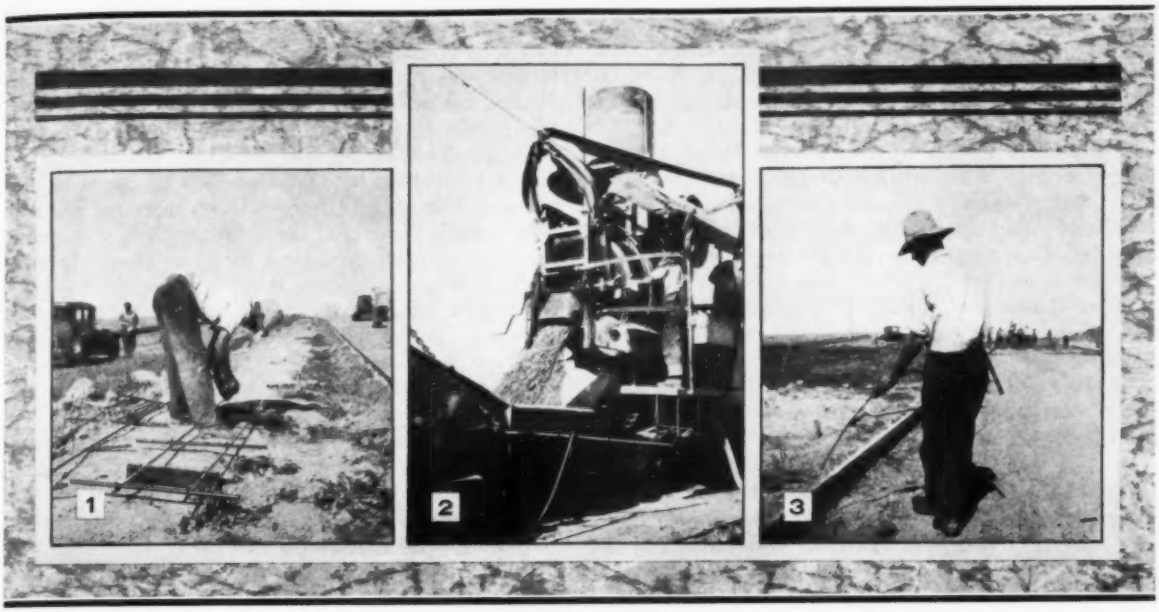
The cement dock was built to handle two cars of cement at one time and was about 84 feet long. The runs from the cars to the central portion of the dock were about 5 feet wide. The section where the Fairbanks beam scales were located and where the dumping traps were set was about 25 feet wide and extended about the same distance from the cars toward the truck runway. The trucks backed under the traps which were of wood with a wood back-stop against which the carts were dumped. Canvas was hung from the bottom of the traps so that it touched the batches of the 2-batch trucks to prevent loss of cement in dumping. There were four men for the cement car which was being unloaded, each with his own cement cart, and two men for the car which was just being opened up. At one side of the dumping dock there was a shed for the storage of cement in bags for culvert and other odd jobs. Lehigh cement from Mason City, Iowa, was used. A bell was used to notify the truck drivers that the two batches of cement had been dumped and he could pull out. This is a small detail, but with the bell located at the level of the truck driver's seat and sounded by pulling a cord from the top of the dock, the driver is warned immediately and there is no shouting back and forth which invariably ends in unpleasantness between the driver and the cement dock crew.

LOCAL SAND AND RAIL-SHIPPED GRAVEL USED

Gravel for this job was shipped in from St. Peter, Minn., by the Hallett Construction Co., and unloaded direct to the bins or to the large stockpile. Sand was brought in by truck from a local lake deposit where it was excavated by a suction dredge. The delivery trucks

PREPARATION OF THE BATCHES FOR THE CENTRAL STATES CONTRACTING CO. PROJECT AT SHERBURN, MINN.

1. The 1¼-yard clamshell handling gravel from the stockpile. 2. The batching plant showing the portable conveyor at the extreme right which rehandled the sand when dumped by trucks from the ramp. 3. The ramp, conveyor and crane serving the batching plant. 4. The dumping trap of the bulk cement dock. 5. The two road pumps handling water from the lake through a Y to the line laid along the shoulder of the road.



ACTION ON THE ROAD

1. Wiring up the contraction joint steel in a frame on the shoulder. 2. The No. 1 paver discharging its batch into the skip of No. 2 paver. Note the smoothness of flow of the concrete. 3. Oiling the forms with an insecticide sprayer.

backed up a wood ramp and dumped off the end onto the boot of a Northern portable conveyor which placed the sand within easy reach of the Northwest crane which handled both the unloading of gravel and the moving of the sand. It was equipped with a 45-foot boom and a 1¼-yard Williams bucket. The crew handling aggregate from delivery units to the batch trucks consisted of two men in the gravel cars, the craneman, a batcher man and one man on the conveyor. The Northern conveyor was equipped for operation by electricity, and the Johnson bins and batchers were furnished with floodlights to permit night work in unloading if necessary. The batches made up for the paving averaged 1,491 pounds of sand, 2,152 pounds of gravel, dry weight, and 659 pounds of cement added at the dock described above, which was located about 500 feet from the batching plant.

The batches were hauled by subcontract by W. W. Magee of St. Paul. A fleet of ten trucks owned by Magee supplemented by seven hired locally and with two or three owned by the Central States Contracting Co. did all the batch hauling.

Water Supply from a Large Lake

Two triplex pumps, a C H & E and a Domestic, were located on the shores of a large lake along the right of way and pumped through a "Y" to a single 3-inch spiral pipe 3,000 feet long to the booster. The 3-inch pipe discharged into a 1,000-gallon galvanized tank from which the C H & E booster pump took its suction and delivered the supply to the 2½-inch line which was placed along the shoulder. Taps for the paver were inserted every 200 feet and every night the night pipe crew removed the valves behind the paver and carried them forward and replaced the paver hose tap with a 2½-inch bushing reduced to ¾-inch for the sprinkling hose taps. The paver carried 200 feet of hose with a coil of 50 feet of extra 2-inch hose on the No. 2 paver for use in case of emergency. Mulconroy fittings were used throughout for the paver hose to make quick tight connections without the need of a wrench.

Tandem Pavers Averaged 1,700 Feet of Slab Daily

Minnesota slab is 9-7-9 inches in section and the average production of a single paver in a 12-hour day is about 1,300 feet. Even this requires the utmost attention to keeping everything in almost perfect running order. The pair of Koehring 27-E pavers working in tandem on this job produced regularly more than 1,700 feet in 12 hours and averaged 134 feet per hour over the 25½ miles built in 1931. The average for 267 miles of concrete paving in Minnesota with single pavers was 109.6 feet per mixer hour.

The grade for the slab was maintained well ahead of the pavers, leaving plenty of room for the trucks to speed in to the pavers and get clear without being hindered by the bunching of the fine grade equipment. High spots in the grade were quickly removed by a Caterpillar Thirty with a Wausau scarifier and a 6-foot rotary scraper. The form trench was cut by a Warco one-man grader which also smoothed off the grade after the excess had been removed or low spots had been built up. A Wehr roller compacted any fill that had to be placed and rolled the entire grade when it had been cut up by the trucks so that it presented at all times a firm consolidated grade for the pavers.

The final trimming of the form trench for the 9-inch Metaforms was done by two men followed by two men on each side setting the forms. Two men behind these lined up the forms and two others tamped them. There were eight men on fine grade who also covered the base of the forms to prevent any concrete from becoming attached to them and being hard to remove when the forms were moved ahead for use again. The

grade was frequently checked by the grade foreman with a scratch template. One man with an insecticide sprayer, which was pumped up and then carried in the hand, sprayed the oil on the forms and also rolled the hose forward when there was slack near the pavers. Rolling the hose forward in a loop about 4 feet high is an effective way of lengthening the life of even the toughest hose. The continued dragging of the hose over the rough shoulder with its accumulation of stones, steel and other sharp materials wears the hose very rapidly. One contractor who did not use the rolling method of moving the hose forward reported that the section of hose next to the paver had to be replaced several times before any other piece had shown signs of wear. Another used an extra heavy hose for the section near the paver. Both were very much interested in the rolling method when informed of it and planned to use it at once.

A Freeman double-ended turntable about 150 feet ahead of the tandem pavers was busy keeping the continuous stream of trucks headed right for speedy clearing after they had delivered their two batches at the skip of No. 1 paver.

The two pavers were attached by a tie bar of a steel I-beam bent to permit the skip of No. 2 paver to drop to a horizontal position to receive the concrete from No. 1 paver. The dumping of the batches from the trucks for a tandem outfit is not the same kind of a job that it is when a single paver is running. The batches are dumped almost twice as frequently as with the single and the trucks have to come and go very quickly. One man, however, handled this traffic problem easily and also cleaned every body where there was any sign of aggregate or cement sticking to the sides or bottom.

A lip or chute with a spring on the discharge of No. 1 paver directed the flow of concrete into No. 2 skip very well. A piece of canvas or belting was riveted to the lip of No. 2 skip to assist in preventing the loss of grout between the two pavers. This worked very well indeed but had to be renewed about once a week because it lost its flexibility and hence its usefulness. It was also rendered ineffective by jamming when the pavers were working around a long curve and therefore not in line. At this time also it was necessary to have a man constantly watching the skip and using a shovel to direct the flow to prevent spillage. This is one of the problems of tandem paver operation which remains to be solved. The man who watered the grade between the pavers was responsible for the checking of spillage between the pavers.

A home-made subgrade planer was pulled by No. 2 paver and the excess earth was removed by two men and shoveled to the shoulder. Three steel men set all the steel including the grills for the dummy contraction joints and the expansion joint assemblies. A wood right-angle triangle was used with a cord across the grade to set the line for the expansion joints to insure accuracy. Wire chairs were used for all the setting of dowels and center steel except where the grills were wired up and the chairs could not be slipped on. In these cases stamped metal and wire chairs were used and locked on by throwing the wire over into the catch on the metal portion.

There were two puddlers and one spader who worked both sides. The No. 1 Ord finishing machine carried two screeds and made two passes over the slab before moving on to the new concrete. The No. 2 Ord stayed 40 feet behind the first for its second pass, giving as few breaks as possible in the final machine finish of the slab. This, it seems, is one of the solutions for the finishing problems brought about by the use of tandem pavers. The work is done so much more rapidly than with a single paver that the usual methods of crowding the finishing machine against the paver cannot be used. If this is done the concrete is machine-finished too green and too far ahead of the initial set so that the best results are not secured. By holding the No. 2 finisher back 40 feet from the first finisher, the conditions which exist in single paver work are more nearly reproduced.

The No. 2 finisher pulled a trailer with a drag cutter for the dummy center joint. This was pushed down into the fresh concrete and the cut made on the second pass of the finisher. The No. 2 Ord operator helped the man who set the T plates for the center joint, to cut the transverse dummy contraction joints by hand. A novel type of cutter was used, consisting of a 4-inch pipe slotted along the bottom and with a plate set into the slot to do the cutting. A pair of plow handles made the handling of the cutter very easy. The plate was held in the pipe slot by bolts set up firmly and run through the plate. The T plates for the center joint were set from the trailer pulled by No. 2 finisher. A well-conceived bridge was used for setting the plates. Instead of reaching under the rear cross plank of the trailer to set the plates, as is done in so many cases, a pair of planks were cantilevered from the rear cross plank so that the man worked in the clear. By having one plank on either side of the center the man could face either way and thus avoid the annoyance of a stiff breeze blowing into his eyes or of the sun in his eyes. This is another example of thought given to details that makes the work easier, less of a burden and hence more satisfactory.

The Iowa or longitudinal float, 12 feet long, was used by two men from a double rolling bridge immediately behind the trailer of No. 2 finisher. The bridge was moved ahead 6 feet each time so that the floating lapped one half on each double pass.

There were two hand finishers who used the drag straight-edges, a belt and long-handled floats where necessary to touch up low spots in the slab. Two men from a double rolling bridge pulled all the T plates, dummy joint wedges, and the caps and boards of the expansion joints which were to be poured later. An interesting and unusual detail which this organization stresses is the uncovering of every expansion joint by one of the puddlers after the No. 1 finisher has gone over it twice. In this manner any irregularity in the setting of the joint which may have been caused by the placing of the concrete on either side is brought to light and can be easily corrected while the concrete is still easily worked. The second finisher then passing twice over the joint finishes it completely and the contractor is sure that when the cap and board are pulled and the joint fully exposed for pouring that it will be straight and cause no criticism from the engineers.

(*Continued on page 34*)

Winter Construction

A Symposium Covering Expense, Excavation and Grading, Steel Construction, Handling and Heating of Aggregate and Protection of Concrete

Part II—Excavation and Grading

TWO of the activities of contractors which are most consistently carried on in winter are excavation and grading. In this work the most important considerations are protection of hand labor from icy gales, the use of proper anti-freeze compounds in the radiators of gasoline shovels and trucks, protection of dynamite from freezing and proper methods of thawing if the explosive is frozen, and the heating of the cabs of the power shovels.

Keep on the Sunny Side

An Iowa contractor who put through some extensive rock cuts in the winter kept his men working on the sunny side of the cut headed north. As soon as the 50-foot cut had been excavated to a depth of 10 or 15 feet both the men and the equipment were well protected from the wind. He stores his explosives in a warm building to prevent freezing. The shovels are all equipped with heated cabs and an anti-freeze compound is used in the radiators. All the shovels are equipped with Kohler light plants to permit late work.

A Variety of Anti-Freeze Compounds

A number of contractors reported the use of different anti-freeze compounds in their trucks and shovels. A Delaware contractor uses both alcohol and glycerine as an anti-freeze mixture for trucks and shovel radiators. Two Illinois contractors report the use of Prestone in the radiators of all their shovels. Several Indiana and Iowa contractors favor the use of alcohol as an anti-freeze. A Detroit contractor reports that he only uses steam shovels in winter so does not need an anti-freeze mixture. He does, however, use alcohol in the truck radiators. A Nevada contractor uses oil in his shovel radiators, while reports coming from Tulsa, Okla.; Portland, Ore.; Missouri and Wisconsin agree on the use of alcohol in truck and shovel radiators. A Nashville, Tenn., contractor requires the operators to drain the radiators of all equipment every night to prevent freezing, while out in Salt Lake City, Utah, a large contractor uses glycerine as an anti-freeze mixture and equips his trucks with a closed cab. Another Salt Lake City contractor keeps the air lines of his jack hammers from freezing by running the air through pipe coils kept hot with a kerosene heater. He also puts some kerosene into the air lines to prevent freezing.

Handling Frozen Earth

A Minneapolis, Minn., contractor uses dynamite for breaking up frozen ground and handles practically all of his excavation by hand. Completed excavation is protected by straw to prevent further freezing on the bottom. If the bottom does freeze, it is thawed with hot water before concrete is placed. A Portland, Ore., contractor reports that freezing is not his greatest worry but that it is most important in excavation in the Pacific northwest to keep an adequate supply of planks on hand to prevent the equipment miring. He says he welcomes freezing weather as it makes work easier.

A Utah contractor who has used considerable hand labor for excavating in winter finds that the use of fires nearby gives some warmth to workers and betters their morale. He states, "Handling earth work in winter is expensive, first due to the fact that it is nearly impossible to get efficient work from your labor. Thus frozen ground must either be blasted or have the ground broken up before the frost so that it can be more easily worked after freezing." A Wisconsin contractor thawed the ground by wood fires burning day and night to permit excavation during freezing weather. After the ground was excavated it was kept from freezing by a covering of straw.

HANDLING EXPLOSIVES

One of the Iowa contractors who reported always stores his explosives in a warm building to prevent freezing. An Illinois contractor stores the dynamite in the watchman's house where there is always a stove to furnish heat. A Minneapolis contractor stores his explosives in an insulated magazine to prevent freezing. He uses dynamite for breaking the frozen ground and handles all excavation by hand. A Utah contractor stores explosives in a house covered with dirt and manure to prevent freezing.

OTHER IDEAS WORTH KNOWING

A Chicago contractor working in central Illinois reports that he has experienced some trouble with ice in the crawler treads of the shovel. This was removed, however, with an Aeroil burner of the type used in small concrete mixers. The same torch was also used to remove the frost from steel reinforcing rods.

A Minneapolis contractor, who always uses an antifreeze mixture in the radiators of his compressors and pumps, houses them at night and on Sundays in a barn or other structure where the temperature is kept around 60 degrees by small stoves or salamanders.

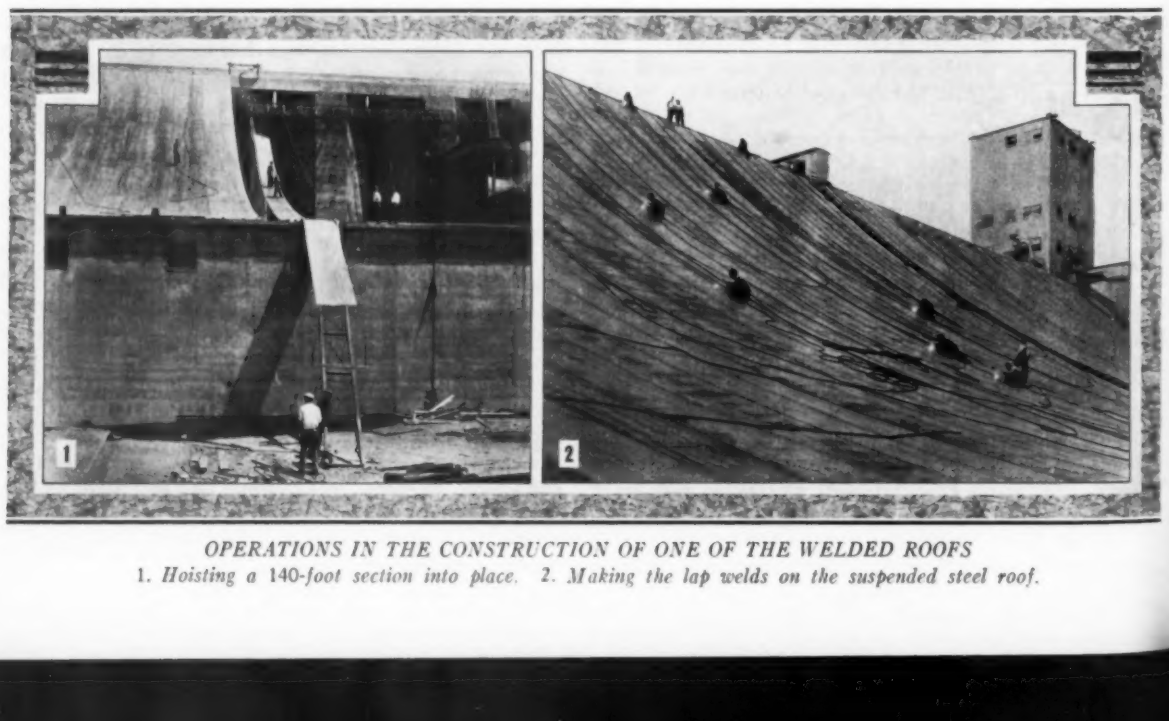
A Self Supporting Welded Steel Roof

AT Albany, New York, the four large grain elevators built by the Port of Albany are roofed in a novel manner. Each roof measures 288 feet wide with a total span of 140 feet and forms a catenary curve supported only at the top and bottom of the roof. Seventy-six sections of 12-gage mild steel sheets, 140 feet in length and 50 inches wide, compose each roof. The lower part of the roof starts on a ramp, approximately 22 feet above the ground level, and extends upward at an angle between 30 and 40 degrees. Both the top and bottom ramps were constructed at an angle to conform with the slope of the roof.

Steel was ordered in lengths of 5 feet, 10 feet and 31 feet 3 inches and each section was assembled and welded on the ground. Five sheets formed a section. These were fitted end to end in a jig and four of the seams butt welded. The last seam was lap welded, the lap weld being tack welded on the underneath side on completion of the section. It was necessary to place one lap weld in each section to compensate for any expansion and contraction caused by welding of the butt seams.

At the ends of each section were two rows of ⅞-inch bolt holes. The outside rows were used for erecting purposes and the inside rows for anchoring to the upper and lower supports. A yoke of ½-inch steel was bolted to one end of the steel section about to be erected. To this was attached a steel cable running through a sheave at the top of the upper roof platform and thence downwards to a hoisting engine on the ground level. As the section was hoisted upwards, it was first guided to the top of the wall by inclined supporting channel members, thence as it crossed the ramp, it slid over two cables stretched from the bottom of the roof to the top at a distance of about 36 inches apart.

A bar with two U-bolts welded in place, so that they would pass over the two cables, was bolted to the roof section to serve as a guide while hoisting. At the edges of the ramps ⅞-inch bolts were anchored. As the sections were hoisted into place, the inner row of holes in each section was fitted over the bolts in the concrete. In erecting, alternate sections were first anchored, leaving a gap of 46 inches. Then the intermediate sections were put in place lapping 2 inches on each side. These sections were erected without the use of cable guides. Instead, boards were held in place across the gap while the sheets were being raised. In order to hold the expansion and contraction to a minimum and to prevent unevenness in the plates in joining them, considerable tack welding was employed. After all sections had been tack welded in place, continuous welds were laid along each seam. The step-back method was used to dissipate the heat and prevent distortion. Small expansion joints were welded in place over the longitudinal seams at every tenth seam, giving the roof free expansion and a floating characteristic. On completion the roofs were given two coats of red lead and one coat of aluminum paint, to protect the steel from the weather. Eight cowl-type ventilators were placed on each of the four roofs. All welding was done by Lincoln shielded arc process using Fleetweld electrodes. With a current of 150 amperes at 32 volts, the speed of welding averaged 40 to 50 feet per hour with a total of eight operators.



OPERATIONS IN THE CONSTRUCTION OF ONE OF THE WELDED ROOFS
1. *Hoisting a* 140-*foot section into place.* 2. *Making the lap welds on the suspended steel roof.*

Levee Building *with a* Tower Machine *and* Crawler Wagons

E. F. Powers Construction Co. of West Palm Beach, Fla. Worked Different Units to the Best Advantage on One Contract

IT is generally conceded among levee building contractors that the fewer times dirt can be handled, the cheaper the work can be bid. Also the length of haul of the dirt dictates within quite close figures the type of equipment that will most economically handle the work. For example, with one handling of the dirt, except for dressing and trimming, the big walker-type draglines will handle dirt up to a distance of 400 feet to the best advantage. From that distance up to about 600 feet the big tower machines are the most advantageous. Then for distances up to 1,500 or even 2,000 feet under good hauling conditions the crawler wagons find their scope of activity. For hauls greater than 2,000 feet and also where the ground conditions will not permit the use of crawler wagons on slightly shorter hauls, the industrial railway finds a wide field of use.

On the construction of 7 miles of new levee near Lake Village, Ark., involving the handling of 2,800,000 yards of dirt, the E. F. Powers Construction Co. was awarded the contract at 12.90 cents per yard. This contractor elected to use an electric tower machine on part of the work and where the haul was greater, installed a complete crawler wagon outfit with three 8-hour shifts for both outfits. The tower machine worked with a 510-foot haul on a 600-foot span and the crawler wagons hauled up to 1,500 feet. The tower machine built up new levee and the wagons were used on base and for the construction of a false berm 100 feet wide on either side of the base for a distance of 1,245 feet.

The Tower Machine

Two tower machines were used on this contract but only the work and details of the newer and larger machine will be discussed in this article. The older machine has a head tower 120 feet high and the tail tower 30 feet high. The new machine, a Bucyrus-Erie electric tower excavator, has a 130-foot head tower and a 50-foot tail tower, measured from the ground. Both were mounted on crawlers. The tail tower carried an 80-horsepower Wisconsin gasoline motor so that in could move itself without the need of carrying a power line across the pit. The head tower had two 600-horsepower General Electric motors to operate the dragline and a 300-horsepower motor on the hoist line. In addition there was a Wisconsin gasoline motor carried in the tower which could be moved into gear with the shaft and was used for tracking in case of a long period of shutdown of electric power or to or from a job.

The tower operated with a 12-yard Bucyrus-Erie

bottomless bucket or a Sauerman 12-yard bucket. The former was used for the bulk of the work and carried a 15-yard load. The other bucket was used when the dirt was wet and for dressing the slopes. Three men were required to operate the tower, the operator, an oiler and a deck man. One man operated the tail tower, the only work required being to move the tower backward or forward in response to whistle signals from the head tower operator. Thus if in moving the head tower ahead, a ridge of material was left in the pit the tail tower was moved back to pick up that material at much less expense than again moving the larger head tower. An expert electrician was also carried on the tower machine to maintain all equipment in first rate condition and to prevent shutdowns for as the superintendent said, when the tower was shut down for ten minutes while a shackle was adjusted on the bucket "a million dollars waits on a nickle." How many times

DIRT MOVING AND MAINTENANCE OF EQUIPMENT AS HANDLED BY THE E. F. POWERS CONSTRUCTION CO.

1. A 12-yard drag bucket operated by the tower machine bringing in a 15-yard load. 2. A dragline loading one of the fleet of crawler wagons. 3. Dumping an 8-yard crawler wagon to build up base for the new levee. 4. A 5-yard wagon working on the false berm. 5. A crawler tractor with a bulldozer spread the dirt dumped by the crawler wagons for the base. 6. The noon greasing. Note the lights strung from poles for night work and the tractor being overhauled at the extreme left. A few moments after this picture was taken, all of the tractors had pulled up to this greasing station and the lubrication crew put in 60 minutes of intensive work.

on construction work of all kinds one sees a large payroll going on while a cotter pin or a bolt costing a few cents is replaced or removed. It was the Superintendent's proud boast that 80 per cent of his operating crew on the tower, tractors and wagons has been with him for two years or more. This is remarkable in this field where men wander from one outfit to another almost as they would change eating places in a city on the slightest whim. The tower machine moved 2,500 yards of dirt from the pit to the levee in each complete 8-hour shift. The tower machine bucket made one round trip carrying 15 yards of dirt every minute and a half when operation was not delayed for any cause.

On new levee ahead of the tower machine one of the draglines cut an exploration or cut-off trench 6 feet deep and 6 feet wide at the top and 4 feet wide at the bottom. This opened up the ground to determine whether there were any stumps or roots in the center of the levee base, and when backfilled with good material served to break the strata of the ground at that point and thus served as a cut-off wall to prevent seepage.

Because of the great weight of the head tower it was found advisable to corduroy the roadway of the crawlers ahead of the machine. This work was done by a crew of three men working in the daytime and using a fine two-horse team for hauling. For night work the towers were completely floodlighted. Six 1,000-watt floodlights on the tower were directed toward the pit and there was an abundance of lights within the machine itself.

In order to provide a check on the actual operating time a Service Recorder was installed in the tower. The vibrations of the tower when in operation cause a short swing pendulum to mark a chart that is locked in the recorder case. When the tower is not working the chart shows a thin straight line as compared to a heavy wide line when in operation.

The ground crew with the tower machine consisted of a spotter for the bucket and two men hand trimming the slope. Also a Caterpillar Fifteen and a John Deere farm plow were used to cut sod ahead of the tower operations. This same tractor with a bulldozer was used to trim the slopes when the dirt was in the right condition for the operation of a tractor on the slopes.

The Crawler Wagon Outfit

The crawler wagon outfit consisted of fourteen 5-yard Western wagons with 15-ton Athey crawler tracks and with the bodies built up 10 inches all around, two 8-yard Smith crawler wagons and ten Caterpillar Sixties, one of which is equipped with a Euclid bulldozer. Loading of the dirt was handled by three Northwest draglines, one Model 5 with a 40-foot boom and a Page 1¼-yard bucket and two Model 6 Northwest draglines with 40 and 50-foot booms and both with 1½-yard Northwest buckets.

The Greasing Crew

The job boasted a blacksmith shop with no blacksmith but with a very complete welding outfit consisting of a U.S.L. electric welding machine and a Modern Engineering Co. acetylene welding unit. During the day when all major repairs were made there were one mechanic and five helpers at work and at night, three mechanics. The mechanic's helpers made up the greasing crew which saw to it that every wagon and tractor was greased twice in each 24 hours. The greasing periods were from 5.30 to 6.30 both A.M. and P.M. and at noon and midnight.

Six open air stalls for the greasing were arranged with trouble lights strung from overhead. The electric current for the lights and for the electric motor on a pneumatic Alemite greasing machine was provided by a Kohler electric plant.

Floodlighting the Pit and Dump

Three 500-watt electric floodlights provided with current from the main electric line furnished illumination for the dump. Each tractor had two headlights and each of the draglines had one boom and two corner lights which provided sufficient light for the efficient operation of the crawler outfit during the night.

Personnel

This levee construction project near Lake Village, Ark., was completed early in August by the E. F. Powers Construction Co. of West Palm Beach, Fla. John W. Stansell was Superintendent for the contractor. The work was done under the direction of the Vicksburg Engineer District, Major T. B. Larkin, District Engineer, with Lieut. A. W. Pence, Area Engineer of the Central Area, in charge of the field work.

More Participants in Highway and Building Congress

IN addition to the various organizations listed as participants in the Highway and Building Congress on page 20 of the September issue of CONTRACTORS AND ENGINEERS MONTHLY, the following organizations will also participate: American Society of Municipal Engineers, Steel Founders' Society of America, Inc., the American Institute of Steel Construction, American Motorists Association, American Society of Mechanical Engineers, Associated Equipment Distributors, Canadian Good Roads Association, International Association of Public Works Officials, Highway Research Board, National County Roads Planning Commission, National Highways Association and National Rural Letter Carriers Association. The Congress will be held in Detroit, Mich., January 16-23, 1933.

WAS THE BRIDGE POSTED?
This Koehring 27-E paver crashed through a 40-foot span bridge in Iowa but came out, with only minor injuries, under its own power assisted by three Caterpillar Sixty tractors.

Hoover Dam

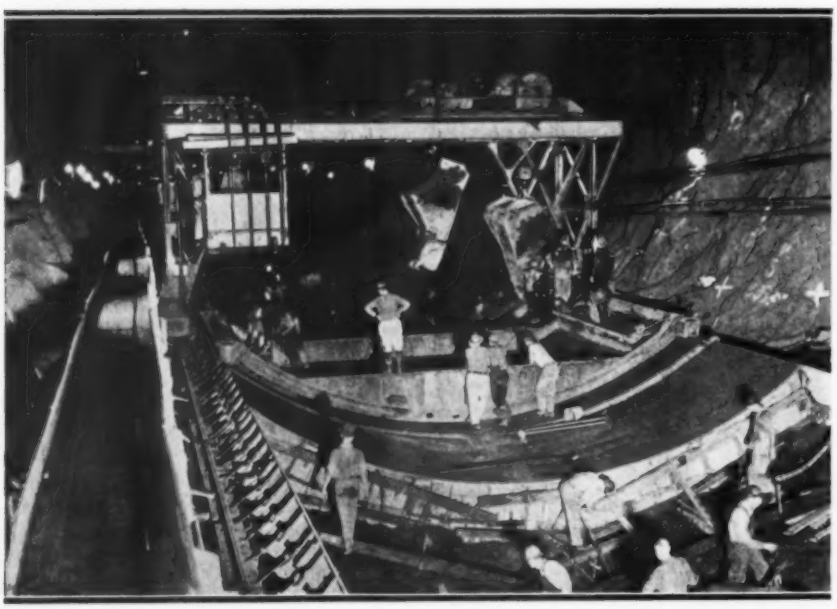
Lining the Diversion Tunnel With Concrete

By
W. R. Nelson
Assistant Engineer
Boulder Canyon Project
Engineering Division
U. S. Bureau of Reclamation

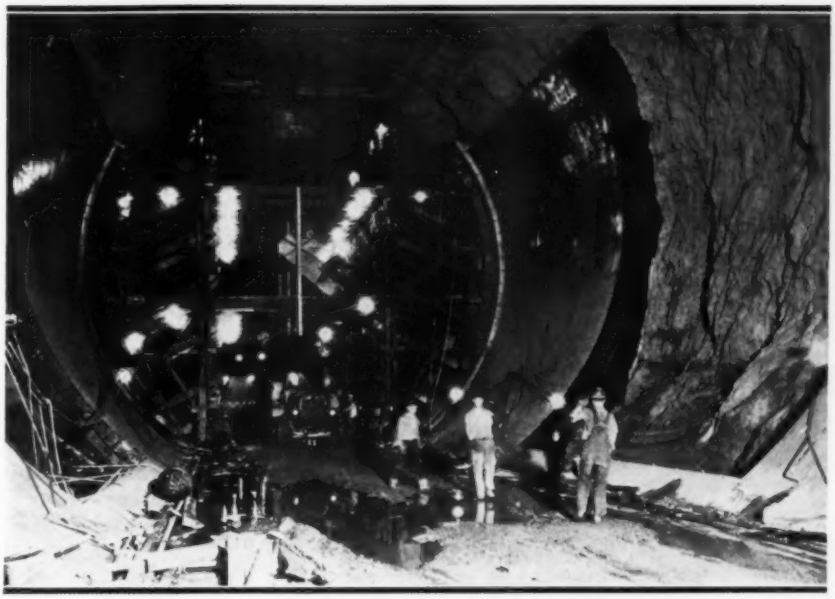
THE type of conveyance used for transporting concrete for the lining of the diversion tunnels for the Hoover Dam depends upon the means adopted for placing the concrete in its final location. Trucks loaded with two 2-yard bottom-dump steel buckets are employed when the concrete is conveyed from the trucks to the pouring site by a gantry crane, and the agitator drum, mounted on the truck, is used when it is possible to pour concrete directly into place or into a chute leading into a hopper, where it is transferred to the steel buckets.

The inlets of all diversion tunnels have been excavated to the portals and a concrete arch cofferdam built around each portal for protection from floods. A rock fill nearly to the top of the cofferdam has been made between these structures and the river and as a result, trucks cannot be driven directly into the tunnels at these portals.

The present procedure for pouring the 3-foot lining in the diversion tunnels is to transport the concrete from the mixing plant to the inlet portals in 4-cubic yard agitator drums. Upon arrival at the tunnel portal the concrete is dumped into a chute leading to a steel hopper from which it is dumped into the steel buckets for placing as desired. These buckets, two of which are loaded on each 10-ton truck, are then conveyed to the pouring site, where a 10-ton gantry crane lifts the buckets from the truck and moves them to the pouring position.



Pouring Invert Concrete in Diversion Tunnel No. 3 of the Hoover Dam Project at Boulder City



Pouring Side Wall Concrete in Diversion Tunnel No. 4. Here Two Forms Are in Use with Alternate Longitudinal Pouring of the Concrete

Lining the diversion tunnels is performed in three operations—the invert section comprising the lower 74 degrees of the tunnel, is poured first; this is followed by pouring the side walls, 88 degrees on each side; followed in turn by pouring the remaining 110 degrees in the roof or crown of the tunnel. All sections are poured for the same linear distance, so that a transverse construction joint is secured around the entire periphery of the tunnel. At present this section is 40 feet in length for all tunnels, except in the portions of the two outer tunnels, which will later be used for spillway purposes, where the construction joints are placed 26 feet 8 inches apart.

Preliminary Operations

Following the excavation of a diversion tunnel to its full 56-foot average diameter, the first operation preliminary to lining is the pouring of a concrete gantry rail base on both sides of the tunnel. The top of this foundation is 3.1 feet in height above the finished tunnel invert, and its inside corner is accurately poured to line and grade at a distance of 15 feet 9½ inches from the center line of the tunnel, with the result that the corner is located 24 inches from the finished face of the concrete lining, the 24 inches being the specified minimum thickness of the lining. On each of these bases, which have an average width of 2½ feet, is placed a 6 x 12-inch timber to which is spiked a 90-pound rail. On these parallel rails is then mounted the 10-ton gantry crane, which is capable of traveling along the tunnel at the rate of 300 feet per minute. The transverse traveler of the crane, equipped with two hooks of 5 tons capacity each and operated by a 10-horsepower electric motor, has a traveling speed of 125 feet per minute and a hoisting speed of 100 feet per minute.

Longitudinal steel side forms 2 feet high, made up in sections 10 feet long, are set in position on the concrete foundation and held rigidly in place by bolting these forms to the gantry rail foundation and to the timber rail base. Transverse steel forms 2 feet wide, approximately 32 feet long, and spaced 26 feet 8 inches or 40 feet apart, are bolted to the longitudinal forms and braced against the rock floor of the tunnel. The space between the form and the floor is filled with a 2-inch timber bulkhead. Both the transverse and longitudinal forms are constructed of 10-gage steel plate, smooth inside, supported by 2-inch angle top flanges and 2 x 3-inch stiffeners. Keyways between the abutting sections of concrete, 1½ x 10 inches in transverse forms and 6 x 12 inches in longitudinal forms, are provided by grooves of these shapes in the steel plates.

Pouring the Invert

The shape of the invert is procured by a device consisting primarily of two steel screeds supported on car wheels which run on the inside bottom flanges of two I beams. The beams, shaped to the invert and separated by an approximate distance of 11 feet, are connected at each end by a steel framework and supported by pairs of car wheels which run upon the upper flanges of the longitudinal forms.

The horizontal upper deck of each screed is mounted on the screed plate, a steel sheet that is shaped to the curvature of the finished tunnel section of 50-foot interior diameter. The screed plate is approximately 11 feet long and 4 feet wide. On the upper deck is mounted a hand winch operating two cables, each of which is fastened through single sheaves to the framework connecting the I beams, so that by winding the winch the screed is moved upward across the invert toward the side forms.

During concreting operations the winch on the screed is unwound, allowing the two screeds to meet at the center of the tunnel. The gantry crane picks up the two buckets of concrete from the truck and transports them to the pouring site. The pouring of the concrete through the bucket gate is controlled by a manually-operated removable handwheel. The concrete is dumped on the tunnel wall side of each screed and puddled into place beneath the screeds. When that space is filled the screeds are pulled toward the tunnel walls

leaving behind them the molded shape of the invert. This process is repeated until the screeds arrive at the side forms.

To move the screeds and their track framework lengthwise of the tunnel, screw jacks installed on the axles of the wheels, which run on the side form, raise the framework slightly, allowing it to be pushed ahead by the laborers to its next position. If the distance to be moved is of great length, the gantry crane picks up the framework bodily and moves it to the desired location.

The surface of the invert is finished by men working from a movable timber platform supported just above the concrete by means of curved I beams placed 5 feet apart. The I beams are connected at each end by a steel framework which contains double flanged wheels running on the gantry-crane track.

After the concrete in the invert has been finished, sand is dumped on it for a depth of approximately 3 feet on the center line of the tunnel to act as a roadway for the operation of the trucks.

POURING THE SIDE-WALL SECTIONS

In preparation for pouring the side wall and crown sections, a concrete shelf 1½ feet wide is poured along each side of the finished invert as a foundation for 90-pound rails which are placed 11½ feet from the center line of the tunnel. These rails are the track for the side-wall jumbo, an 80-foot long and 50-foot high structural steel framework weighing 385 tons, which supports the ¼-inch steel skin plate for forming the walls.

This jumbo is equipped with chutes, a traveling crane, and other mechanism for placing the concrete in the designated position, and a series of screw jacks and ratchets used for distributing the hydrostatic pressure of the green concrete and for the adjustment of the position of the wall forms for pouring as well as for moving the jumbo to a new position. Because of the unequal length of the walls on the curves, the jumbo is made up in five panels, three of 20-foot, and two of 10-foot lengths. Each of these sections is equipped as a unit with supporting double-flanged wheels, rectangular chutes, and "coffin" chutes. Screw jacks and steamboat ratchets are mounted at the top of the section and bear against the rock crown to resist the upward pressure of the green concrete. Other jacks are installed in the ends of the horizontal struts connecting the forms on each side of the tunnel. These bear against the arch beams holding the steel form face. On curves, wooden gores are built between the steel sections.

A 5-ton bridge crane, equipped with two steel hooks and powered by a 10-horsepower motor, runs on a pair of 50-pound steel rails carried on a longitudinal 10-inch H beam, which is in turn supported by the vertical struts on each panel. The bridge has a traveling speed of 300 feet per minute and the transverse traveler a hoisting speed of 100 feet and a traveling speed of 125 feet per minute.

The concrete chutes from the interior face of the jumbo to the faces of the forms are spaced from 4 to 6 feet vertically at the form face and are from 8 to 16 feet in length. Six of these chutes are of ordinary type, 12 inches deep and 30 inches average width, made of ¼-inch plate and 2-inch angles. The opening in the form face at the lower end of the chutes is closed when desired by a 12 x 24-inch steel door pushed into position, flush with the form face and bolted in place. The uppermost chute, termed the "coffin" is, in effect, a hopper 3 feet 3 inches deep at the end next the tunnel center line, 12 inches deep at the form face and 4 feet wide. This chute is hinged at the form face, and concrete is dumped over the top of the form by raising the loading end by means of a cable connected through sheaves to a compressed air winch located at the base of the jumbo. This "coffin" is made and operated in the manner designated in order to permit pouring the top 4 feet of the wall which otherwise could not be poured by gravity because of its proximity to the roof of the tunnel.

POURING THE CONCRETE

Pouring operations consist of lifting the 2-cubic yard bucket from the truck which has been driven to the section of the form designated for pouring, hoisting the bucket to the chute where the concrete is required, moving the bucket so that the hooks on the bucket gate are above the 3-inch round tripping iron bar over the chute; then by lowering the bucket slightly the tripping bar opens the bucket gate, pouring the concrete into the chute. When emptied the bucket is disengaged from the bar, lowered to the truck, and the other bucket is lifted, moved to the opposite side of the tunnel and poured in a similar manner. An inspector and five to seven laborers are behind each form to puddle the concrete into place. A timber bulkhead, framed to provide a 1½ x 10-inch keyway similar to that in the invert concrete, is placed at the center or one-third point of the 80-foot length of forms, and each of these 40-foot or 26-foot 8-inch sections is poured to the top of the form before the adjacent section is started. As the top part of the section is completed, carpenters remove the lower part of the bulkhead, continuing this removal as the concrete rises in the section. Obviously, concreting is started at the lower level of the chutes, and the doors at the ends of these chutes are closed before pouring is started through the next set of chutes above. A longitudinal keyway, approximately 2 x 10 inches, is formed or cut in the top of the sidewall concrete, against which the crown concrete will abut.

In August, 1932, 34 hours were required for pouring an 80-foot section of wall on each side of the tunnel. After the 80-foot section has been poured the forms are required to remain in place for 12 hours. When this period has elapsed the timber bulkhead, erected at that end of the form which does not abut on a previously poured wall section, is removed, the jacks and ratchets are loosened and the form is moved to a new position. Moving the jumbo is accomplished by means of a block and tackle attached to the rails ahead and rigged to air winches installed on the jumbo at its base. Each 80-foot section of sidewall requires approximately 60 hours per cycle.

THE CROWN SECTION—FORMS AND POURING

A structural steel jumbo is used for pouring the concrete in the crown section of the diversion tunnel. Essential parts of this jumbo are a concrete gun carriage, pipe carriage, traveler, and arch-form support. All these parts are supported on flange wheels traveling on the 90-pound steel rails laid for the side-wall jumbo.

The gun carriage, approximately 45 feet long and 47 feet high, is equipped with a two-drum electric hoist and two pneumatic concrete guns, with their receiving hoppers and concrete conveyors of 8-inch wrought iron and rubber hose. A 25-horsepower motor is used to move the carriage on its track. Its maximum speed is 100 feet per minute in a forward direction or 20 feet per minute in reverse. The hoist for raising the buckets of concrete is powered by a 50-horsepower motor and has a lifting speed of 300 feet per minute.

The pipe carriage and traveler serve to support the 8-inch pipe through which the concrete is forced into the space above the crown forms. The pipe carriage in pouring position is connected to the gun jumbo, while the traveler may be moved to a position between the pipe carriage and the arch-form jumbo to support the conveyor pipe.

The arch-form jumbo is made up in 10-foot and 20-foot panels, each panel of which is built of structural steel and equipped with jacks to place the face of the form in the correct position for pouring, or to lower the form face away from the finished concrete. Trusses at 7-foot 4-inch maximum intervals, having lower chords 33 feet 4 inches long, support the center 88 degrees of the crown section. The ¼-inch form face and its supporting beams for the lower 11 degrees on each side of the center are connected at one end to the truss and supported at the opposite and exterior end by screw jacks bearing on the framework of the jumbo. Bulkheads are placed to secure transverse construction joints at 40 feet or 26 feet 8 inches, in a manner similar to those for the invert and sidewall sections.

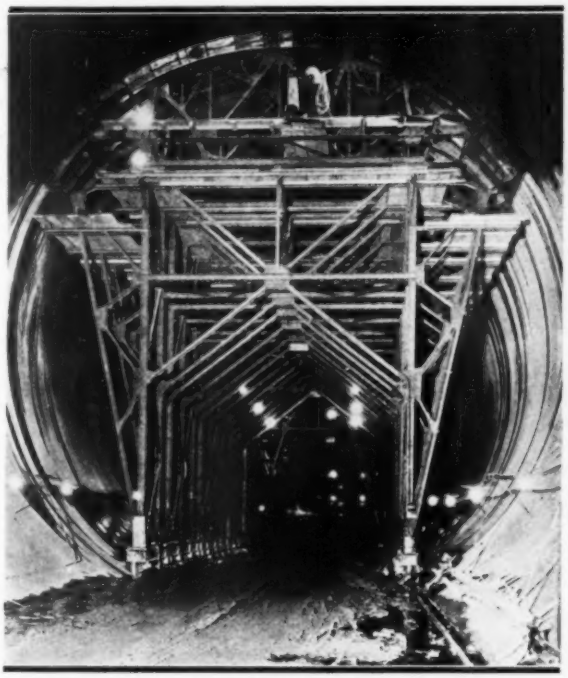
For pouring, the electric hoist installed on the gun carriage lifts the 2-yard buckets from the truck and dumps them into the gun hopper. The gun, by air pressure, forces the concrete through the 8-inch pipe to the center of the arch form. From here it flows to its final position through a 90-degree elbow and continuation of the conveyor pipe, or by a chute and baffle arrangement running down the arch form. Pouring is started at the end of the form farthest removed from the gun, and the conveyor pipe and the placing device are pulled lengthwise on the forms as concreting progresses.

CURING

All concrete in the tunnels is sprinkled as soon as the forms are removed and is kept continuously wet for 14 days thereafter. Pipes with jet sprays are installed along the walls and a film of water is permitted to run uninterruptedly over the concrete surface. This water is pumped from sumps dug near the ends of the tunnel portals, the water being comparatively clear as the silt is removed by the filtering action of the loose excavated material.

PERSONNEL

The lining of the diversion tunnels constitutes a prominent part of the concrete pouring program for the Hoover Dam and serves to give an impression of the magnitude of the work and the efficient methods the contractor is using to gain the desired results. Lining the inclined spillway tunnel, the spillway open cuts, the pressure tunnels, penstocks, and pouring concrete for the intake towers and the main structure, a 727-foot dam and its attendant power plant will present special problems, each of which will be solved in a different manner. Six Companies, Inc., general contractor for the project, is responsible for the methods described above. For the Bureau of Reclamation, the work is in charge of R. F. Walter, Chief Engineer, and Walker B. Young, Construction Engineer, under the direction of Elwood Mead, Commissioner of the Bureau.



The Steel Carriage Supporting Form for the 110-Degree Top-Arch Concrete in the Diversion Tunnel Lining. Note the Jacks and Wedges by Means of Which the Form Is Placed in Position and Lined Up.

[EDITOR'S NOTE: We are indebted to the Bureau of Reclamation for both the text and illustrations.]

Safety Plus Economy

SAFETY in the construction industry means not only the prevention of accidents but also the preservation of health. Science has done much to develop protective measures, many of which bring operating economies at the same time that they save the lives of the workers.

In a recent communication to the *New York Times*, Frances Perkins, State Industrial Commissioner of New York, calls attention to one of the latest developments in the field of industrial hygiene—a device for removing dust in rock drilling. The use of this device was inaugurated at Radio City a few months ago to reduce the hazard of silicosis to the worker. After three months of continuous use it has been discovered that the system not only spares the lungs of the workmen but also lowers drilling costs. Drilling which formerly cost 35 cents a foot is now 23 cents a foot; the time required to drill a hole has been lessened and the cost of keeping drills in condition is reduced one-third.

Commissioner Perkins said, "It is my conviction that the new process, having been proved successful from both the humanitarian and an economic standpoint, should be adopted by all firms which include rock drilling as a necessary part of their work. I know of no greater achievement in industrial hygiene since the substitution of an innocuous phosphorous in the making of matches."

How the Other Fellow Did It

Construction Briefs

Home-Made Bulk Cement Traps

185. In traveling around the country we have seen a great many home-made bulk cement docks and dumping traps, many of them exceedingly crude but working fairly effectively. The most common type of trap is a small platform hinged to the dock and supported at the far end by the truck body when it is let down for dumping. It is counterweighted with cables and wooden boxes containing gravel or more generally scraps of metal from a local junk yard. A type of home-made dumping trap which has been seen with slight variations on several jobs and which works particularly smoothly was noted in a well-built form on a job in northwestern Iowa. Instead of the trap that must rest on the trucks for support or be held up by the cable of the counterweight, the platform was built with long beams that extended under the cement dock so that when the trap was let down to dump the cement cart, the beams came up and rested against the under part of the dock, giving ample support to the trap without any encumbrances such as cables in front. The trap was built of 2 x 10-inch planks at the side and extended under the dock with scrap iron counterweights hung on the end. Across the side timbers were 2 x 6-inch planks for the platform of the trap. Six-inch truck chassis channel frames were used as tracks on the trap to take the wear. The whole trap was hinged with U-bolts around a piece of cold-rolled shafting 2 inches in diameter. Running the cement carts onto the trap dropped it and running off let the weights lift it slowly. There was, however, a rope attached to the end to help start it as lubrication was quite a problem in the presence of so much cement. The dumping hole in the trap was surrounded with galvanized iron and hung with canvas to prevent the spreading of the cement as it was dumped. 23.4.44

Watering Wheels of Road Rollers on Bituminous Work

186. In order to prevent sand asphalt or other hot-mix asphalt from sticking to the rolls of 3-wheel road rollers, it is necessary to sprinkle them with water. In most cases it is done by carrying a ½ or ¾-inch pipe out over the rolls and permitting water to run onto them through small holes bored in the bottom of the pipes. The water is carried in a tank above. A Canadian contractor developed a scheme to conserve water which we now have seen copied on several contracts. Instead of carrying the sprinkler pipe all the way across the roll, it was carried only half-way and an ordinary fibre door mat attached to the pipe. This distributed the water evenly all the way over the roll and required much less water to keep the roll damp. 23.3.59

No Runaway Rolling Bridges Here

187. In level country laborers operating longitudinal floats from rolling bridges do not have to worry about the bridge running away with them. They are, however, faced with a certain amount of instability as they pull the heavy "bull float" back and forth. A pair of float operators on an Iowa contract put an end to this rolling motion simply by keeping four wedges on the bridge at all times and as soon as the bridge was moved ahead one man would insert two wedges on either side of the front wheel on his side and the other would put two wedges on the rear wheel on the other side. That made the bridge stationary until the wedges were removed. 23.4.46

Read This and Profit

188. A contractor in eastern Illinois operating an industrial railway to handle batch boxes to the paver ran into some difficulty in handling the aggregate and cement. A little experimentation, however, solved the problem in a simple manner. His trials and the solution are recorded here that other contractors may profit by them. At the start the gravel was placed in the batch boxes first and then the train run forward to the cement dock and the six bags of cement dumped into the boxes on top of the gravel. Then to prevent the cement from blowing and to complete the batch, the sand was placed on top. This was ideal for preventing the cement from blowing off the batch, but it was found that the cement worked down through the gravel during the long haul over the rough track to the paver and tended to stick to the bottom of the box when it was dumped at the paver. This difficulty was overcome by reversing the order of the aggregates, placing the sand on the bottom and the gravel on top of the cement. This had an additional benefit because the gravel hit the skip first and tended to clean it on each delivery to the paver drum. 23.4.51

Hot Shower Baths

189. In hot weather or cold, around asphalt plants, tunnel jobs, crushing and screening plants and in fact, on almost any construction operation, the men appreciate a hot shower bath at the end of the day's work. Many contractors feel that this is a social refinement that has nothing to do with the effectiveness of the men on the job. Others make a point of always installing shower baths where warm or hot water is available. On an asphalt job visited in Ontario, the superintendent ran a steam line from the boiler to the asphalt plant. A contractor on a tunnel job where there was no steam equipment overcame the apparent lack of a heating unit by rigging up the cooling water from his air compressor so that whenever the men came out from the shift, hot water was always available for use in the camp immediately outside the compressor house. 23.2.73

Preventing Over-Run in Weighing Batches

190. Where a batching plant is equipped with dial scales, the batcher man has little difficulty in following the weight of the aggregate as it flows into the batcher. With beam scales it is different as the beam scale will not lift until the exact amount of aggregate has been weighed. Numerous methods have been used to provide a tell-tale so that it will not be necessary to shovel out excess aggregate from the weighing batcher. One contractor in Illinois used the usual beam scales and had a heavy nut on a hooked wire which was hung on the wrong side of the scale beam giving a light weight for the batch, then as that balanced, the nut was removed and the scales again balanced. It required about 20 pounds of aggregate to bring the scale to an even balance the second time and the flow of this amount was easily controlled with the gates of the bins. Other contractors we have noted have used a small tare weight on the top beam of the scales which was kept in a low position until the beams were balanced and then slid out to the proper weight. The use of the nut and hooked wire described above is perhaps a little less crude as it does not necessitate moving any of the weights on the scale and thus tends to avoid inaccurate settings. 23.4.43

Ten Miles *of* Variable Width Paving *in* Wisconsin

Garvey Weyenberg Construction Co. Ran Own Gravel Pit, Had Adjustable Equipment for 18 and 20-Foot Pavement and Poured an Average of 1,050 Feet per 10½-Hour Day

MANY contractors in the East prefer to buy sand, gravel and stone from a commercial operator. In the South contractors usually run their own quarries, particularly in West Virginia. In the Middle West the contractor seems to prefer to locate a gravel pit for his job and then subcontract for its working during his paving contract. In some cases the contractor has run the pit himself as with the Garvey Weyenberg Construction Co. of Appleton, Wis., during the construction of 10 miles of 20 and 18-foot concrete pavement between Wausau and Marathon. The grade of the road ran fairly uniform with a long stretch of 10 per cent grade on the 18-foot pavement up the hill in the town of Marathon.

Great Excess of Sand in Pit

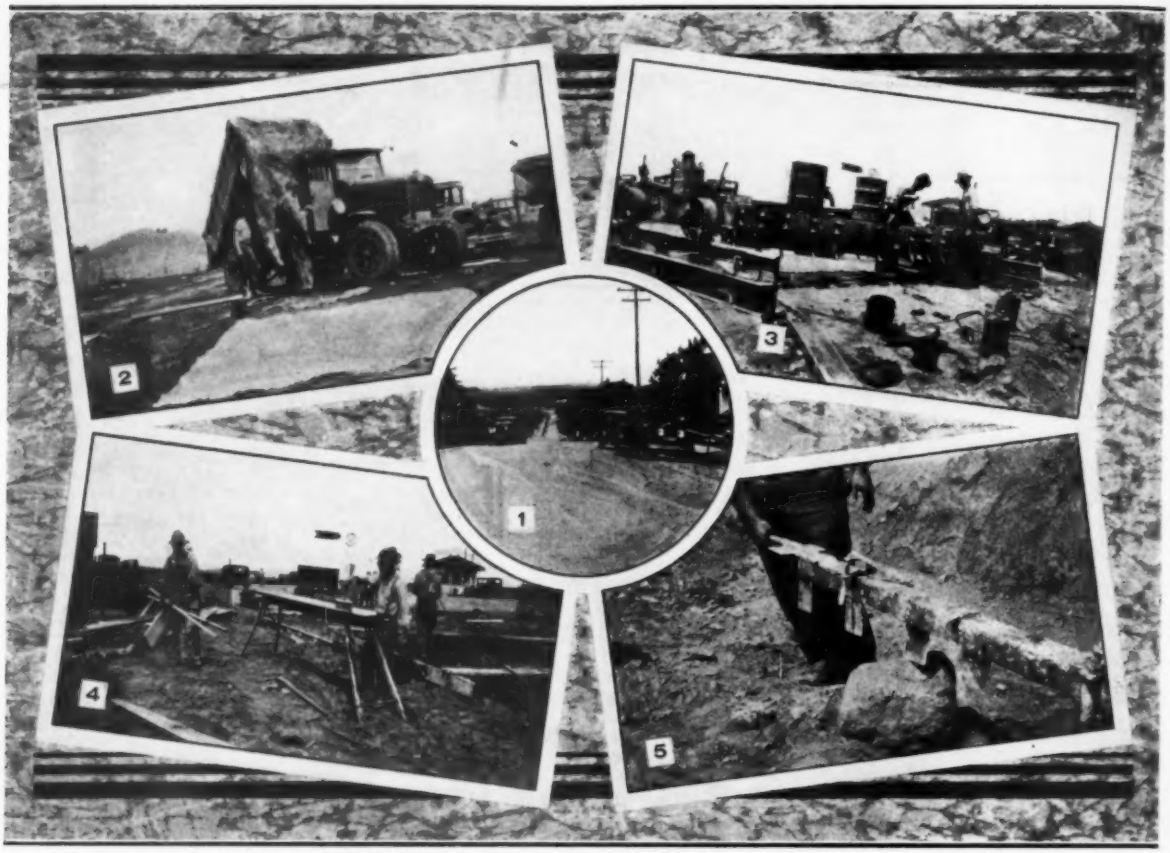
It was necessary to open a very large area to secure the required amount of gravel for the paving contract as the sand ran very high in all parts of the pit. Stockpiles of sand were all around and somewhat in the way of the much needed gravel stockpiles. Run of bank material was excavated by a P & H ¾-yard shovel in the pit and hauled to the receiving hopper of the washing and screening plant by two shuttle trucks. A rail grizzly kept the exceedingly few large stones from the feeder belt to which the material flowed through a slot in the hopper. There was one man on the grizzly who watched the rate of feed. The only other men used on the plant were a greaser and the foreman. There was one man at some distance on the wash water pump. A 20-inch centrifugal pump driven by a Waukesha motor from an old dragline furnished an ample supply of water from a lake nearby.

The primary belt conveyor took the material up to a 42-inch circular screen and washer. The standard sizes went to the three stockpiles, one for sand and two for stone. Oversize stone went by chute to the Allis-Chalmers 8-inch McCully crusher and was returned to the main feeder belt by a bucket elevator. On the screen a long roller idler was arranged to knock the small stones that had caught in the holes back into the screen so as to maintain its efficiency.

The material from the stockpiles was handled from ground storage to the three-compartment Butler bin and batcher by a Northwest crane with a 45-foot boom and a 1-yard Owen clamshell bucket. This machine was run in two shifts because of the necessary double handling of the sand to clear it from the vicinity of the batching plant. The batch trucks entered the plant by driving about one-quarter mile from the main road, a dead haul of 2 miles from the job and then backing under the batcher plant.

Handling the Bulk Cement

Bulk cement was received on a siding close to the batching plant in box cars and unloaded by four men. Two shoveled to the concrete buggies and two wheeled



THE DAY THE OUTFIT SHIFTED INTO MARATHON

1. The long hill through Marathon which was the next section to be paved. 2. Tuning up one of the trucks and using a large tarpaulin for an awning. 3. Changing over the subgrader to the 18-foot width. 4. Making a new "bull float" using the two sets of handles for legs. 5. One end of the expansion joint placer.

and weighed, the pairs alternating to relieve the strain of working inside the cars for long periods. There was also one man outside covering the cement in the batch with sand. A Fairbanks platform scale was located just outside the door of the box car for weighing the 700-pound batches of cement. The cement dock was extended by a hinged platform that was swung down onto the side of the trucks so that the buggies could be wheeled right up to the top of the truck and the cement dumped without spilling. The cement dock was capable of handling two cars of cement at one time.

A fleet of one and two-batch trucks including Internationals, Reo's, Diamond T's, Fords and Chevrolets, totaling from 12 to 32 trucks, handled the hauling of the batches. All hauling was done by subcontract. The batches consisted of 1,200 pounds of sand, 1,400 pounds of coarse gravel and 1,250 pounds of fine gravel for the 700-pound batch of cement.

ROUGH GRADING INCLUDED SOME TOUGH ROCK

The rough grading for this job was done under subcontract by John F. Bloomer Construction Co. of Appleton, Wis. The contract called for the moving of 240,000 cubic yards of excavation of which 35,000 yards was a very hard quartzite rock. This was removed with Sullivan compressors and rotators drilling maximum 8-foot holes and blasting with du Pont 60 per cent dynamite in the bottom and 40 per cent toward the top of the holes. The work was all done in ledge rock.

FINE GRADE WAS RELATIVELY SIMPLE

The preparation of the fine grade included the use of two Caterpillar Thirties, two Wausau scarifiers and two Euclid rotary scrapers. The grade was trimmed to the proper cross section with a Lakewood subgrader and rolled with a Good Roads-Monarch Cub gas roller. Four men handled the trimming of the grade by hand after the Lakewood subgrader had been pulled over by the Caterpillar Thirty. Any excess of dirt was pulled out by the Tumble Bugs.

After the trench for the forms had been cut by the patrol grader two form setters and two helpers kept the Blaw-Knox 9-inch forms set a full 1,000 feet ahead of the paver. Behind them one man straightened the forms and oiled them. One man operated the Freeman turntable.

WORKING THE CONCRETE

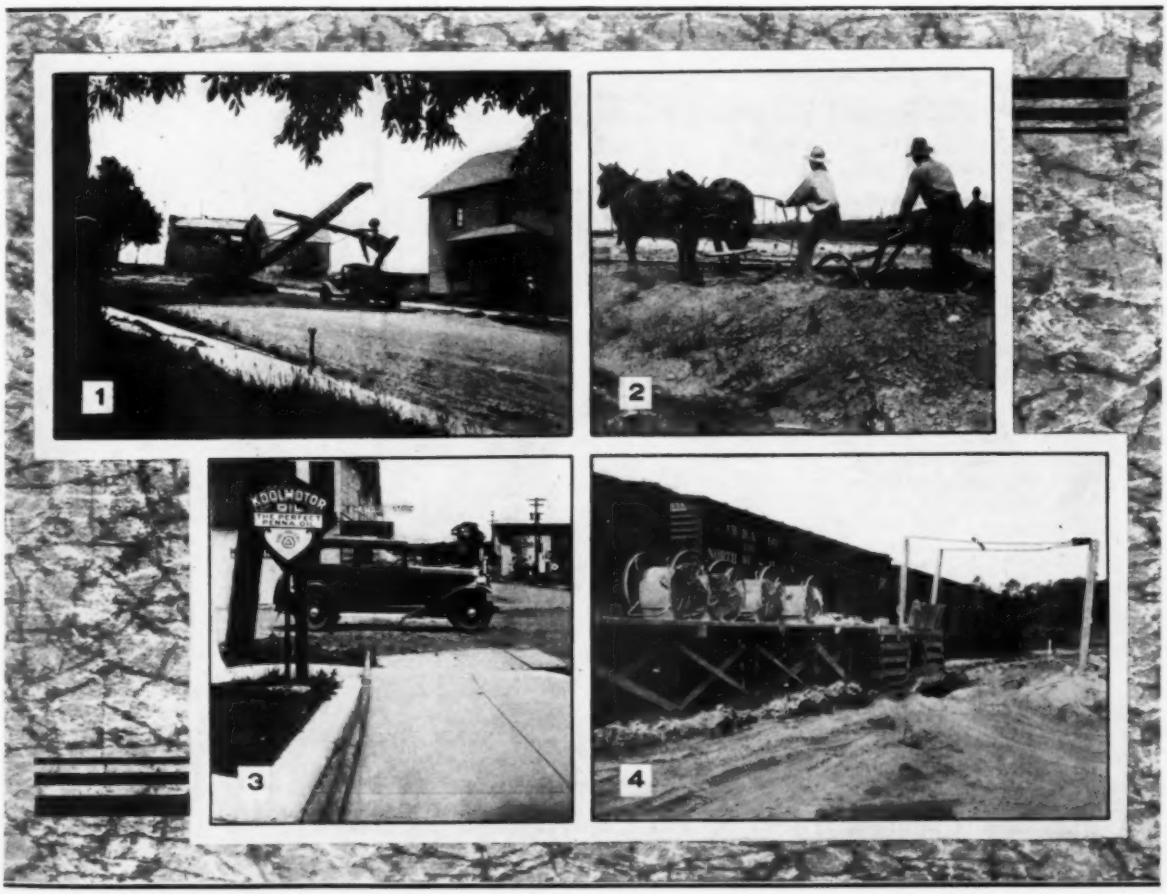
The paving crew which placed the concrete and made the average of 1,050 feet of pavement per 10½-hour day was well-organized and worked as a unit. Appreciating this and the faithfulness of the entire outfit, during the terrific heat wave of late June, 1931, when men on other jobs were dropping from exhaustion, the contrac-

tor arranged for rest periods from 9.30 to 10 A.M. a lunch period from 12 to 1.30 P.M., and another rest period from 3.30 to 4 P.M.

One man ahead of the paver dumped the batches from the trucks into the skip of the Rex 27-E paver. On this job the specifications called for ½-inch expansion joints of Elastite every 50 feet. These were set with a novel type of bulkhead developed by this contractor and later adopted quite generally in Wisconsin where premoulded joint is used. The joint setter or bulkhead is built up with a 3 x 3-inch angle iron shaped cold to the crown of the grade and with 4-inch plates riveted on and so spaced that they miss the dowels through the expansion joint. The plates carry to the grade to support the joint material the full depth. They are bent to present a flat surface to the joint material. Along the top of the joint setter are several lugs projecting over the joint to prevent its riding high at any point. The vertical leg of the angle iron has a strip of 1½ x ¼-inch strap iron riveted on to hold the angle to the crown of the road. At intervals of about 3 feet across the horizontal leg of the angle iron are eccentrics with handles fully 6 inches long and the eccentric offset about one inch so that when the handle is turned it forces the eccentric against the premoulded joint and holds the material firmly in place when it is turned upside down and placed on the forms. The only handles for using the device are one pipe riveted on at each end.

There were two men shoveling from the Koehring subgrade planer attached to the Rex paver and these men also set the steel and the expansion joints. One man handled the placing of the continuous center strip just behind the paver and before the pouring of the concrete. Both Ceco center strip and Ceco 6-inch mesh reinforcing fabric were used. Three puddlers spread the fairly dry mix and handled the steel mesh as it was placed on the concrete 2 inches from the top of the completed slab. The operator of the Ord concrete finisher kept a full strike-off of concrete to get the maximum compression on the material in the slab. There were two men on a double roller bridge using the 12-foot longitudinal float, known locally as the "bull float," and these same men did the belting of the slab to remove excess water. One man took care of the edging on the transverse joints and along the form. He was followed by two men covering with burlap and sprinkling.

The covering of the slab with earth the day following pouring and the filling of the tranverse joints was done by subcontract at a rate per foot. The contractor main-



SOME DETAILS OF THE GARVEY WEYENBERG JOB AT MARATHON, WIS.

1. Starting grading at the top of the Marathon Hill. 2. Loosening dirt along the shoulder for the earth cure cover. 3. The water line for the paver was carried along the sidewalk through Marathon and carefully buried at all street crossings. 4. The cement dock showing the hinged section of the platform which was let down onto the side of the trucks so that the buggies ran on to the trucks and dumped direct.

tained from one to five men back sprinkling the cover. In order to assist the men to secure sufficient loose material for the cover the contractor used an Imperial plow to loosen the earth along the shoulder.

One man pulled the forms and with one team and driver hauled the steel forms ahead to the form setters.

The Lakewood subgrader, the Ord finishing machine and the various bridges for the finishers were all adjustable and were used for both the 20-foot pavement on the highway and for the 18-foot pavement through Marathon.

WATER SUPPLY

Two road pumps were used to supply the water for the job. A C H & E dual-triplex was used at one end and a C H & E triplex at the other end so that the sprinkling and the paver would not interfere with each other. Shut-off valves were placed in the line every 1,000 feet to isolate the two operations completely. Taps for the paver hose and for the sprinkling were placed every 300 feet in the line and the paver carried 165 feet of Roadbuilders 1½-inch hose. The contractor, for a good part of the season, used two hose to prevent any loss of time from shut-downs due to changing the hose connections. A "Y" with three valves was used in place of the regular hose connection so that either hose could be shut off separately and the third shut the paver off from both hose at one time.

THE CONSTRUCTION CAMP

The contractor maintained a camp for the paving organization and boarded and lodged about seventy-five men. A portable cook building measuring 18 x 45 feet was erected in 9-foot sections and a sleeping wagon was used for the foremen. That measured 9 x 24 feet and took care of six men. The office for the contractor and his superintendent was on an old truck chassis and had every convenience that can be expected in a construction camp. On most other jobs of this organization knock-down bunk houses in sections were erected for the men but near the work this time a deserted farmhouse was available and that with the barn made excellent quarters. The truck drivers were included in the figure for the number of men boarded and lodged. They had separate quarters.

PERSONNEL

This contract which called for the use of equipment that would finish both 20-foot and 18-foot pavement was completed by the Garvey Weyenberg Construction Co. of Appleton, Wisconsin, with Hugh Garvey and C. J. Garvey active in its prosecution. L. E. Hill was Superintendent for the company on this work. For the Wisconsin Highway Commission, E. J. Weinbauer was Resident Engineer.

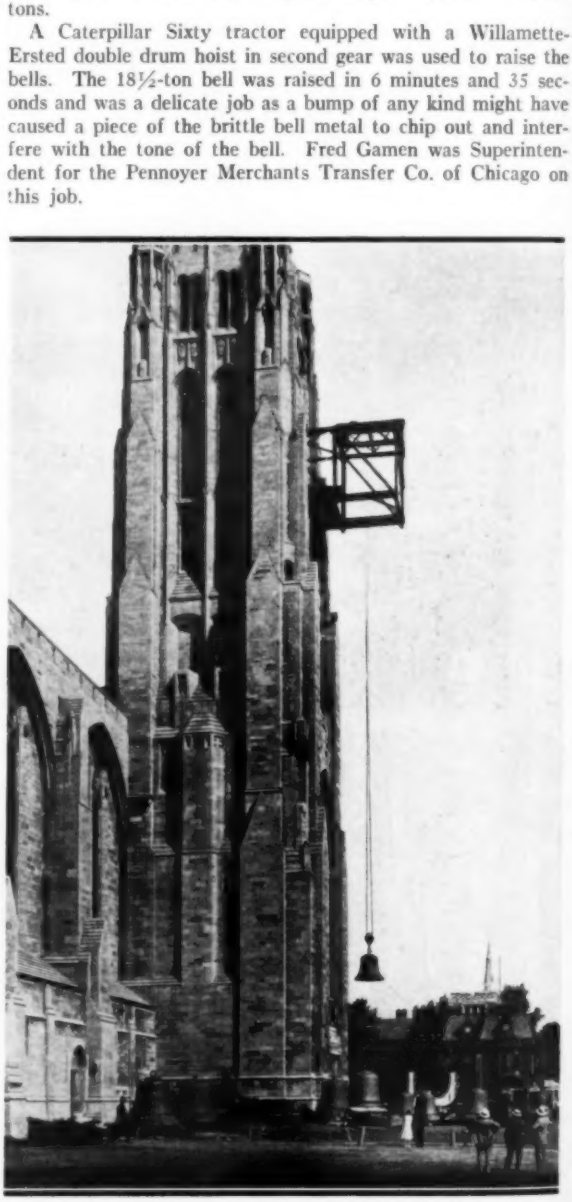
Are You Planning Winter Work?

Then don't miss the current series of articles on Winter Construction which began in the October issue and which offers helpful suggestions on the various phases of expense, excavation and grading, steel construction, handling and heating of aggregate and protection of concrete.

Placing the New University of Chicago Carillon

WHEN the new $250,000 carillon, a gift of John D. Rockefeller, Jr., in memory of his mother, was placed in the University of Chicago by the Pennoyer Merchants Transfer Co. of that city, some interesting details were noted. A steel outrigger was built, as shown, in the upper section of the tower and from it was suspended the rigging to hoist the bell onto a car which ran out on the outrigger. Each of the group of bells was raised a distance of 180 feet from the ground to the outrigger and then swung in. The largest bell and two of the other large bells of this set of seventy-two were lowered within the tower from the level of the outrigger approximately 30 feet to a lower level. The total weight of the bells was approximately 206 tons and the steel framework which was sent from England weighed approximately 80 tons.

A Caterpillar Sixty tractor equipped with a Willamette-Ersted double drum hoist in second gear was used to raise the bells. The 18½-ton bell was raised in 6 minutes and 35 seconds and was a delicate job as a bump of any kind might have caused a piece of the brittle bell metal to chip out and interfere with the tone of the bell. Fred Gamen was Superintendent for the Pennoyer Merchants Transfer Co. of Chicago on this job.



Raising One of the Bells of the New University of Chicago Carillon with a Tractor-Powered Hoist

Drilling *and* Blasting *in* Highway Grading

Part III

Reported by
Andrew P. Anderson
Highway Engineer
Division of Management
U. S. Bureau of Public Roads

THE amount of explosives required per cubic yard of material tends to remain much more nearly constant, increasing only slightly as the depth of the holes decreases. Both theory and practical experience indicate that in shallow cuts it is cheaper to drill proportionately much deeper below grade than is advisable in the deeper cuts. This, of course, requires more explosives in moving non-pay material, but decreases very materially the unit cost per cubic yard for the total combined operations of drilling and blasting. Experience has also shown that in very deep cuts of tough, very blocky, or non-uniform rock thorough breakage can not readily be accomplished if the holes are spaced as far apart as theory would indicate to be possible. While in most rock work encountered in highway grading the spacing both between holes in transverse rows and of rows from the face or from each other bears some fairly definite relation to the depth of cut in that particular material, there is both an upper and a lower limit fixed largely by considerations of cost and the difficulty of effecting the proper degree of fragmentation.

The spacing of drill holes both from the face and from each other should be proportioned to the depth of cut at that point, except that only in the most exceptional cases where it is impractical to drill the holes at least 4 feet deep need the spacing of rows ever be less than 3 feet from the face or between rows. For most rock the spacing between holes need never be less than 4 feet, provided that the total depth of the hole is not less than 4 feet and penetration at least 1½ feet below the level to which the material must be removed. In very tough or blocky material, a spacing of over 10 to 12 feet will usually require the drilling of secondary holes to about one-third to one-half the depth of the cut in the middle of the areas formed by a hole at each corner. These secondary holes, as well as any supplementary charges in the stem of the main holes, are then fired simultaneously with the main charges. This method should give good breakage for cuts up to 20 feet which probably is close to the limit of the present economic depth of a single lift in most rock materials. In sidehill work considerable care must be taken in arranging the layout of the drill holes in order to prevent a too wide spacing for the shallow holes.

As has already been indicated, it is usually found advisable to drill the very shallow cuts considerably below grade in order to permit a wider spacing and to reduce the drilling cost. While a strict adherence to the rather general practice of spacing the holes three-quarters of the depth of the cut would, in a 2-foot cut, require over 14 feet of hole per cubic yard of pay material, according to the formula given above, the drilling of 4-foot holes 4 feet apart and 3 feet from the face would reduce the drilling to about 4.5 feet of hole per cubic yard of pay material. The total amount of explosive required per cubic yard of pay material would be probably about doubled but this would be largely compensated for by the saving in blasting caps, wiring and time and trouble of loading. Where hard shooting is permissible the total cost of drilling and blasting a cut as shallow as 2 feet can be still further reduced by additional increases of the depth and spacing of the holes and the amount of explosives. This is especially true for materials which are not very difficult to fragment or shatter properly. Increasing the depth of the holes in the above 2-foot cut to 5 feet and the spacing to 5 and 4 feet, respectively, would require only about 3.38 feet of drilling per cubic yard of pay material, a saving of about 1.1 feet of drilling at the cost of an increase of about one-fourth to one-half pound of explosives per cubic yard of pay material.

On a few jobs it was found advantageous to use two different depths of hole. For example, for one blast the first holes were drilled about 18 feet deep including 3 feet below grade with a spacing of 12 feet across the cut and about 11 feet between the holes which were not staggered. A second set of holes was then drilled in the center of the squares formed by the four holes to a depth of about 7 feet, or not quite through the hard top strata which rested on a thin seam of softer material. The deep holes were sprung and the principal charge placed at the bottom with a smaller charge in the stem above the soft material. The shallow holes were only lightly sprung so that the charge occupied slightly more than one-half the depth. The explosive was 40 per cent dynamite and all charges were fired simultaneously.

Drillling Costs and Rate of Production

On typical projects the average cost of drilling in fairly hard uniform rock with the customary jack hammers was nearly 30 cents per linear foot of finished hole. Largely because of the varying nature of the rock the

drilling cost per foot varied over a wide range and occasionally reached about double this figure. One rather expensive job on which the average depth of the holes was 5 feet with most of the cuts from 2 to 5 feet deep, required 2.85 linear feet of drill hole per cubic yard of rock at a cost of $1.60 per cubic yard or 56 cents per linear foot of drill hole for the drilling alone. On the other hand on some jobs involving mostly deep holes the drilling per cubic yard was sometimes as low as 0.1 foot. There is no definite indication that the net hourly rate of drilling is appreciably faster for shallow than for deeper holes, except in materials which give trouble from sticking or broken drills. The slightly larger time losses in the deep holes from changing steel, blowing holes, etc., seem to be largely compensated for by the fewer moves until a depth of about 20 feet is reached, after which the rate slows up. All but five of the rock jobs studied used air-driven jack hammer drills weighing about 70 pounds each and all statements and conclusions are based on the use of drills of approximately this size and type.

The rate of drilling varies with the material, the type of equipment, and the management. On some individual jobs over 60 per cent of the time the drilling crew was out on the job was non-productive. The rate of production per elapsed hour was therefore low on these jobs, regardless of the kind of material. The following table shows the average rates obtained on all the jobs for which complete data were available, the net rate while the drill was actually in operation, and the causes of the more persistent delays.

The materials listed in this table have been grouped in accordance with their apparent ease or difficulty of drilling as indicated by these studies rather than according to the usual classification. The table shows that while the average actual cutting rate of the drills in some materials was nearly 75 per cent more than in others, the actual production of linear feet of completed drill hole per hour during the time the crew was out on the job was much more nearly uniform and the maximum difference in actual production of finished drill hole per drill was less than 35 per cent.

AVERAGE RATES OF PRODUCTION AND TIME LOSSES FOR DRILLING IN VARIOUS MATERIALS; 60 TO 70 POUND JACK HAMMERS USED IN MOST CASES

Item	Sandstone, Hard Shale, Hardpan, Disintegrated Granite *Feet*	Granite, Porphyry, Felsite Trap, Basalt *Feet*	Hard Limestone, Stratified but of Uniform Hardness *Feet*	Limestone Stratified with Clay Seams *Feet*	Weighted General Average of Studies *Feet*
Feet drilled per hour, total study time	13.8	14.8	15.5	11.5	14.2
While drill was in operation	36.2	28.9	24.2	21.2	26.1
DELAYS DURING STOP-WATCH STUDIES*					
Change drills	12.1	9.8	7.1	7.8	8.9
Clean or blow holes	23.4	10.0	4.0	14.0	11.1
Steel stuck or broken	15.8	7.6	5.3	5.3	7.3
Move to new hole	2.5	4.9	7.2	3.4	4.0
Springing holes	....	1.5	1.0	1.7	1.4
Operator	3.2	4.4	4.7	4.0	4.0
Mechanical trouble	.7	2.2	3.2	2.0	2.0
No steel	.2	3.8	1.7	.5	2.6
Miscellaneous	4.1	4.4	1.9	7.1	4.3
Total lost time while out on job	62.0	48.6	36.1	45.8	45.6

*Delays are tabulated in percentage of available working time.

The time losses or delays in the easily drilled rocks of the first group were so large as more than to counterbalance the gainful effects of easy drilling. The chief delays were due to cleaning the holes and to stuck or broken drills. These causes accounted for about two-thirds of the total time losses in the soft or decomposed materials, as against one-third for the same items in the igneous rocks of the second group. The poor showing in the actual cutting rate in the stratified limestones was largely due to the caution continually exercised by the drill operators to avoid crooked holes and stuck drills. That such caution can be made to pay is evident from the fact that while the cutting rate in hard stratified limestone was 25 per cent less than for the rocks of the first group, the actual production in finished drill holes was over 12 per cent greater. The generally rougher country in which the igneous rocks are usually encountered is reflected in the difficulty of keeping the drill operators supplied with steel. For the igneous group 3.8 per cent of the otherwise available working time was lost on this account, as against a maximum of 1.7 per cent for any other group.

(Continued in the December issue)

Attention to Details Makes Job Run Smoothly

(Continued from page 18)

CURING

For the initial cure two men spread burlap as soon as the finishing was completed. These same men removed the burlap the following morning and also pulled the forms. One or two men depending on the run and the time of day sprinkled the burlap for the first 12 hours. Two teams with drivers and two helpers brought forward the forms as rapidly as pulled and spotted them along the grade immediately in front of the form setting crew.

From six to eight men covered the slab with earth for the cure and as many as nine men sprinkled the cover for six days. When the slab was ready to open to traffic the earth was removed by a light patrol grader pulled by a truck.

Immediately ahead of the covering crew two men poured all the joints, both dummy and expansion, with a bituminous grout of tar and lime.

PERSONNEL

This 26.46-mile paving project was handled completely by the Central States Contracting Co. of Crosby, Minn. The work of fine grading was started on May 7, 1931, and the pouring of concrete on May 9. The slab was completed on September 10 and the shoulders finished for final estimate on November 1, 1931. George Leonard was Superintendent for the contractor. The Resident Engineer for the Minnesota Department of Highways was D. P. Poboisk.

Specifications for Clay Sewer Pipe

COMMITTEE C-4 of the American Society for Testing Materials has recently prepared Tentative Specifications for clay sewer pipe. These specifications cover clay products intended to be used for the conveyance of sewage, industrial wastes and storm water. The committee, which is headed by G. T. Hammond, Brooklyn, N. Y., Chairman, with E. S. Rankin, Bureau of Sewers, Newark, N. J., as Secretary, is very anxious to secure the opinions and criticisms of engineers and others interested in the use of clay products.

Copies of these new Tentative Specifications as well as the Standard Specifications which they are to supercede, may be secured from the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Penna., by any one interested and comments and criticisms are invited.

The Editor Comments—

Now for a Steady Pull

Politics, disarmament, foreign bonds, foreign finances and many other things have been causes in retarding recovery from the present economic condition. One of the best statements which has come to our attention recently on general business conditions is that of the National City Bank of New York in its October *News Letter*, reading as follows:

"The past month has brought further evidence of emergence from the period of panic and credit strain, and likewise indications of the expansion of business activity for which everyone has been so anxiously watching. The improvement has proceeded unevenly, and its failure to reach the heavy industries with more vigor has been viewed in some quarters as a cause for disappointment. Where this is the feeling, however, the fault is in too high expectations. Experienced observers understand that the first impetus for the upward move comes from the exhaustion of stocks of apparel and other goods of every day necessity, which are used up faster than they are replaced, leading inevitably to a renewal of buying and of production to take care of current needs. The pickup now taking place is largely of this character. The improvement in industries whose products are less urgently needed awaits gains in purchasing power, the carrying out of replacement and expansion projects, and the growth of confidence promoting capital investment. Therefore it comes more slowly."

The Construction Superintendent

The Boss of the job is the Superintendent. In the last four and a half years I have visited 353 construction projects in the civil engineering field to secure information and data for readers of CONTRACTORS AND ENGINEERS MONTHLY. In that time I have met the finest body of men one could hope to find anywhere as Construction Superintendents. They are a whole-souled lot, eager to do the job right and to do it quickly at the least possible cost consistent with first class work.

One day a superintendent with whom I had lunch at his camp said, "How old do you think I am?" I looked at him carefully. He was quite weather beaten, rather short in stature and not a gray hair in his head. I guessed "40." He laughed and said, "Add 17 and you have me right."

This incident set me thinking of the ages of the men I have met in the field. Some of them small wirey chaps with no gray hair admitting to 50, then a downy lipped youth with a bald head; big brawny men that have drilled for oil in Texas and put down roads in half of the states in the Union; some polished roughnecks and others uncouth college graduates, some smeared with oil and grease, and dirty as could be because they insist on digging into every bit of machinery to be sure that it is operating correctly. Then on the next job you meet a Beau Brummel, without a speck of dust on his clothes, his shoes polished to mirror-like perfection and still he's the Boss.

The Dean of them all was 62 years old, with a glorious shock of gray hair, a grip that made you wince and a mind as keen as a newly-honed razor, with a background of philosophy that would put many a college professor to shame. "There's plenty of time to think on a construction job when things are running smoothly. You have a changing group of men of all kinds to study and if you pick your foremen correctly you don't have to worry about breakdowns and trouble on the grade and that give you more time to think." This results in better organization, smoother and faster work and a satisfied group of workmen, all of which contribute to the profits—the goal of every contractor!

The Sick Dog

There is a contractor in Baltimore who has a reputation for taking almost perfect care of the equipment that he uses. So much so that he has been operating trucks this summer that are nine years old and they don't look six months off the assembly line on the outside or under the hood. Why? He puts in repair parts when needed and sees that the machines are looked after and greased when they need it. He is not in the class of the local government unit that had a piece of equipment in service for twenty years, having completely rebuilt the machine several times over, spending huge sums to have the parts made specially because they were out of stock. This contractor knows his costs and when a piece of equipment is past its productive age, out it goes. He takes care of everything the same way.

The junk man came to the yard one day to take away some old parts and left a very dilapidated dog behind. The yard man took the dog, nursed it and a month later when the junk man came again the yard man said, "Here's your dog, he is better now, take him away." The junk man denied ownership of the dog and recalled having tried to get rid of him for a woman. The dog stayed at the yard and became quite a pet. In the course of events a family arrived but the dog was injured seriously at the time. The contractor sent the stray dog to a hospital, paid for an operation and hospital care until the dog was able to return to the yard.

There is a human side to contracting. That man takes good care of his equipment, the stray dog within his gates and sees to it that his men are employed as continuously as possible in their proper fields of activity.

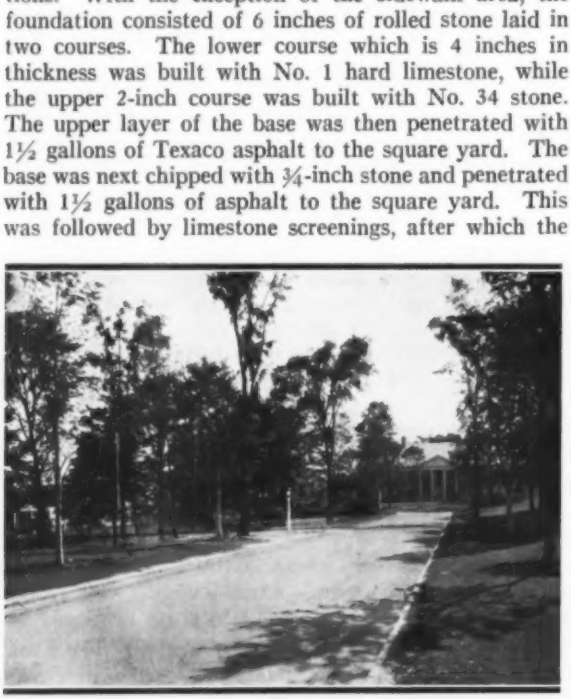
Theodore Reed Kendall

Surfacing the Driveway *and* Sidewalks *at the* Cleveland Country Club

By
Berton S. Russell, Jr.
Manager
Cuyahoga Asphalt & Paving Co.

IN selecting a type of surface for the driveway, parking area and sidewalks, the officials of a country club have in mind a surface which will not only give years of trouble-free, economical service, but also one whose attractive appearance will fit harmoniously into the general scheme of the club grounds. Two years ago, the Cleveland Country Club decided upon asphalt construction as a type which would meet all of these requirements.

The type of asphaltic wearing surface, as well as the type of foundation constructed at this country club, varied somewhat, depending on traffic and other conditions. With the exception of the sidewalk area, the foundation consisted of 6 inches of rolled stone laid in two courses. The lower course which is 4 inches in thickness was built with No. 1 hard limestone, while the upper 2-inch course was built with No. 34 stone. The upper layer of the base was then penetrated with 1½ gallons of Texaco asphalt to the square yard. The base was next chipped with ¾-inch stone and penetrated with 1½ gallons of asphalt to the square yard. This was followed by limestone screenings, after which the base was thoroughly rolled by 10-ton tandem rollers. Approximately 1,500 square yards of the base were laid on a 10-inch fill over a swamp.



The Entrance and Drive to the Cleveland Country Club

As the wearing surface for most of the driveways and the parking area, a 2-inch coarse-mix asphaltic concrete was specified. When this surface had been laid and rolled, it was given a squeegee coat of asphalt at the rate of ¼ gallon to the square yard. To enhance the appearance of the surface red granite chips, passing a ¼-inch screen, were applied at the rate of 15 pounds to the square yard. The composition of the asphalt concrete mixture was as follows:

6½ per cent asphalt cement
6 per cent silica dust
30 per cent lake sand
57½ per cent hard limestone from ¼ to 1¼ inches in size

Because of the heavy truck traffic using the service driveway of the country club, it was considered desirable to build a wearing surface of sheet asphalt. The sheet asphalt consisted of 1½-inch binder and 1½-inch top, the latter composed of the following mix:

10½ per cent asphalt cement
11 per cent silica dust
78½ per cent lake sand

The foundation under the sheet asphalt was identical with that employed under the asphaltic concrete.

In addition to the driveway and parking area, approximately 500 square yards of sidewalk were also paved with asphalt. The asphaltic concrete type of surface was chosen for the sidewalk, but instead of a 6-inch rolled stone foundation, 4 inches of rolled slag were specified. The slag was not penetrated with asphalt.

The asphalt used throughout all of this work was a 50-60 penetration material, except in the case of the sheet asphalt surface on the service driveway, which had a penetration of from 40-50.

As a finishing touch to the above work, a 4-inch by 18-inch Georgia granite curb was provided for either side of the driveways and around the parking space.

The asphaltic construction of the Cleveland Country Club has now been in service for two years, and has required no further attention up to this time.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Who Stands Damage to Borrowed Construction Equipment?

The business of renting construction equipment has become so general as to make it a matter of considerable interest to contractors to understand what responsibility a borrower assumes for the return of the equipment in as good condition as when received.

As noted by the decision announced June 18, 1931, by the Virginia Supreme Court of Appeals in the case of Du Pont Engineering Co. v. John P. Harvey Construction Co., 158 S. E. 891, the question depends upon the wording of the lending agreement.

It was decided that a borrower of a steam shovel was not liable for damage done to it without his fault, or the fault of his agents or employees, unless the contract of hiring contained provision to the effect that the shovel would be returned in as good condition as when received. Had there been such provision in the agreement, the contractor would have had to make the damage good, although perfectly innocent of any fault in the commission of the injury.

Liability for Material Wrongfully Rejected

"The county was liable for material furnished pursuant to the contract, which was wrongfully rejected," declared the Kansas Supreme Court May 9, 1931, in upholding the rights of a highway contractor. (Roberts v. Board of Commissioners of Nemaha County, 298 Pac. 754.)

Unnecessary Letter Accompanying Bids Caused a Lawsuit

"The enclosed proposals for 'Resurfacing Findlay Street from Ninth Street to Sixteenth Street' and 'Eighth Street from Gallia to Campbell Avenue' are predicated upon our being awarded both jobs."

It did not cost a firm of street contractors much ink or paper to write the foregoing sentence in a letter to the City Manager of Portsmouth, Ohio, accompanying separate bids on two jobs. But the communication was not merely a useless one; it took litigation through three courts to determine whether or not the quoted sentence vitiated both bids.

The proposals proved to be lowest on both jobs and an award was made to the firm. Unsuccessful bidders seized upon the letter as claimed ground for setting the award aside, and a lawsuit was on.

Upholding the award, in an opinion rendered March 25, 1931, the Ohio Supreme Court said in the case of Harrell v. Manning, 175 N. E. 606:

"We have no difficulty in reaching the conclusion that the city manager was clearly within his rights in disregarding the letter, because it was no part of the bids. The bids in themselves were completed in every requirement, and, being the lowest and best bids submitted, it was not only the right, but the duty as well, of the city manager to award the contracts accordingly."

Moral: Do not write letters when none are necessary.

General Contractor's Liability for Materials Furnished to Subcontractor

"We are not liable for materials that were furnished to the subcontractor in building that bridge, because they were not sold to us," said a general contractor and his surety on a bond to pay for all material and labor used on the job.

"That contention," replied the materialman, with a little chuckle, "reminds me of the old wheeze about the man who refused to pay a bartender for a glass of whiskey because he had not drunk it and who refused to pay for a glass of brandy, because he had exchanged the whiskey for the brandy."

The Louisiana Supreme Court evidently thought that the materialman's rejoinder was well put, for that tribunal said in the case of Colonial Creosoting Co. v. Perry, 124 So. 182:

"It would be a travesty on the law and a mockery of justice in these circumstances to permit the contractor and his surety to escape liability under the contract and drive their creditors, who relied on the face of the contract and bond, to recourse against an impecunious subcontractor, who was not even allowed the privilege of receiving at first hand from the highway commission any of the price for the construction of the bridge."

Contractor Must Be Somewhat a Policeman

Little Willie, or whatever was his name, was swinging on a rope suspended in a building under construction in Covington, Ky. As he swung through one of the windows, over a sidewalk, he accidently struck a lady pedestrian who unluckily chanced to be passing. This caused the lady to fall against a pile of bricks and injure her sufficiently to cause her to sue the owner of the building and the contractor for $10,000 damages.

"Assuming that things happened just the way plaintiff says they did, we are not liable," is what the defendants in effect said in the case of Lipscomb v. Cincinnati, Newport & Covington Street Railway Co., 39 S. W. 991, decided by the Kentucky Court of Appeals June 12, 1931. "The kid was a trespasser and we did not foresee that anything like that was going to happen."

Therefore, defendants asked that the suit be dismissed without trial, on the ground that the plaintiff failed to state a legal claim. The trial judge in Covington ordered the suit dismissed, but the Court of Appeals reversed the decision, deciding that an actionable claim was stated. The suit was predicated upon a theory that the defendants knew that boys were swinging on the ropes and took no steps to prevent it. Said the Court of Appeals:

"It cannot be maintained that the negligence of the boy was the proximate cause of the plaintiff's injury and that therefore the defendant is not liable. The defendant was without right to allow any use of its property endangering the safety of people on the highway, and if it knowingly allowed other persons, without regard to age, to swing out of the windows of the building and across the sidewalk, this was a use of its ropes and its property which endangered the safety of persons on the highway."

Construction Industry News

National Equipment Corp., Milwaukee, Wis., has announced the appointment of Carl S. Wagner as General Sales Manager. In 1916 Mr. Wagner became associated with Insley Manufacturing Co., and since that time has been actively connected with the construction equipment industry.

Rex-Watson Corp., Canastota, N. Y., has announced the appointment of S. Earle Ackerman as General Sales Manager in charge of domestic and foreign sales. Mr. Ackerman was General Sales Manager of the Franklin Automobile Co. for eleven years and in 1926 began operating his own distributing organization. Another appointment of this company is that of Clayton S. Carris, of Savannah, N. Y., as its western New York representative. Mr. Carris has automotive experience dating back to 1903 and during the past eleven years has served the White Co. as branch manager and the Stewart Motor Corp. as district sales manager.

Construction Machinery Co., Waterloo, Iowa, has announced the appointment of the Allied Equipment Co., Oklahoma City, Okla., as distributor for its products in the State of Oklahoma.

Republic Steel Corp., Youngstown, Ohio, has announced the appointment of J. E. McFate as its sales representative in the New England territory with headquarters in Boston. Mr. McFate was formerly associated with Jones & Laughlin Steel Corp.

Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., has announced the appointment of the H. B. Fuller Equipment Co., 520 Union Bldg., Cleveland, Ohio, as the distributor for the Link-Belt line of shovels, cranes and draglines in northeastern Ohio.

Ingersoll-Rand Co., 11 Broadway, New York City, has acquired exclusive rights to market SKF drill steel throughout the world under the trade name IR-SKF.

Beebe Bros., Seattle, Wash., has licensed the London Concrete Machinery Co., Ltd., London, Ontario, for the manufacture in Canada under Canadian patents of the Beebe Bros. all-steel hand hoist which is in general use in the United States and several other countries.

Lincoln Electric Co., Cleveland, Ohio, has announced the appointment of Fred C. Archer as Manager of the Philadelphia district. Mr. Archer was previously President of the Fred C. Archer Co. which he organized in 1925. The Philadelphia office is located at 401 North Broad Street and maintains a sales and service organization for the complete line of Lincoln products.

American Institute of Steel Construction, New York, elected the following officers at its tenth annual convention held recently in Pittsburgh: President, Clyde G. Conley, Mt. Vernon Bridge Co., Mt. Vernon, Ohio; First Vice President, Clyde MacCornack, Phoenix Bridge Co., Phoenixville, Pa.; Second Vice President, H. A. Fitch, Kansas City Structural Steel Co., Kansas City, Kans.; Treasurer, Robert T. Brooks, George A. Just Co., New York City; Assistant Treasurer, A. J. Post, Post & McCord, Inc., New York City. The next convention of the Institute will be held in Chicago.

United States Pipe & Foundry Co., Burlington, N. J., has announced the removal of its eastern sales offices from 905-909 Morris Building, 1421 Chestnut St. to 1624-1630 Lincoln-Liberty Bldg., N.E. corner Broad and Chestnut Sts., Philadelphia, Pa.

Amerika-Interessen, Inc., Chrysler Bldg., New York City, is the American unit of A. G. Fuer Amerika-Interessen operating also in Berlin, Paris and London and has been organized to bring foreign patents to American manufacturers enabling them to exploit new domestic markets. This company will also negotiate reciprocal arrangements abroad for American patents.

The Kron Co., Bridgeport, Conn., has announced the appointment of Glenn E. Weist to its personnel. Mr. Weist was formerly Sales Engineer of the Milwaukee Electric Hoist Division of Harnischfeger Co. and will be in charge of engineering.

Hanson Clutch & Machinery Co., Tiffin, Ohio, has announced the sale of five Hanson excavators to the California Department of Public Works, four of which are for the highway division at Redding and the other one for Eureka. This sale was made through Norris K. Davis, San Francisco, representative for Hanson in California.

Roots-Connersville-Wilbraham, Connersville, Ind., manufacturer of blowers, exhausters, pumps and meters of both the rotary positive and centrifugal type, has announced the removal of its New York City office to 24 State Street. D. L. Dowling is district engineer with N. C. Barnard and A. E. Loyd as sales engineers.

Vibrating Concrete from Within

MOST devices for vibrating concrete are used on the reinforcing or forms. The Vibro-Spade made by the Electric Tamper & Equipment Co., Ludington, Mich., is placed within the concrete itself. It makes it possible for the contractor to use one man in puddling the output of a half-yard mixer, and it handles mixes drier than can be spaded readily by hand.

The Vibro-Spade consists of a steel head about 6 inches in diameter containing a motor wound for 110-volt, 3-phase, 60-cycle alternating current. The motor is operated from portable power units, or rotary convertors to change 220-volt or 110-volt direct current to 110-volt, 3-phase, 60-cycle alternating current, and transformers can be supplied if the proper A. C. voltage is not available at or near the job site. The units, or rotary converters, to manipulating handle, made in sections of aluminum tubing, with the switch always on the top section for ease in starting and stopping.

The Vibro-Spade in Use Within a Form of Concrete

The New Page LM Dragline Bucket

A New Light Weight Dragline Bucket

A NEW series of dragline buckets designed especially for digging light soils such as can be plowed by two horses has been announced by the Page Engineering Co., Clearing Post Office, Chicago, Ill. Light weight, strength and simplicity are the chief characteristics of this Class LM bucket. They represent a combination of electric arc welding plus hot riveting. The side walls and back are formed of thinner gage steel plate than the bucket bottom, yet they present one surface. The joints are apron-welded and the seams are ground down smooth. This fusing makes for one-piece construction and insures strength where it is needed. The arch and bump plates are likewise welded and securely hot riveted to the walls of the bucket. The arch construction comprises two channels facing inward and joint welded, leaving no openings. The lip is of forged steel and heat treated. The cutting edge is machined and the plate connections are recessed to eliminate overlaps. The teeth are of new light Page design, fastening to the lip in a new manner to prevent working loose. The lip construction is such that the bucket can be used with or without teeth. The hitch plate construction, covered by patents, makes possible any desired pitch and also limits wear to two easily replaceable stock parts, namely, a clevise and pin. The dump block embodies a sheave which increases the leverage on the dumping cable, causing the cutting edges of the bucket to lift first. The bucket can be lifted as soon as it is loaded eliminating a long drag and saving wear on the drag brake, drag cable and dump cable. The sheave maintains the carrying position of the bucket throughout the swing to the spoil bank.

Portable Screening and Crushing Plant of Unit Construction

A PORTABLE crushing and screening plant which will enable contractors to work good local gravel deposits in competition with short-haul commercial pits, has been developed by Stephens-Adamson Mfg. Co., Aurora, Ill. This unit-type plant consists of a number of standard units designed for quick assembly in different combinations to suit the particular job or deposit in which the operator is interested. These include a receiving hopper and feeder, crushing unit, screening unit, storage hoppers and complete belt conveyor units. Each unit is self-contained, comparatively light and easy to move, thus simplifying the job of moving and setting up in new locations. Also only the units required have to be purchased; other units may be added later.

The crushing unit is built to take one or two crushers of various makes, types and sizes. The screening unit will mount a single, double or triple deck vibrator screen. When washed material is required water sprays are added above the vibrator screen and a classifier or dewatering unit is quickly inserted. Gas or diesel engines or electric motor drives can be furnished and where electric power is not available for motors, portable generator sets are furnished.

A Shouldering Attachment for Elevating Graders

AS a means of reducing the expensive operation of shaping shoulders along paved highways because of the cost of removing the excess dirt, the Western Wheeled Scraper Co., Aurora, Ill., has developed a shouldering attachment for use with the Western No. 6 elevating grader in place of the plow. This attachment will build a shoulder to line and grade and at the same time will load the excess material for use in bank widening or other disposal.

The shouldering attachment consists of a strong blade fastened to a frame which is rigidly fixed to the elevating grader in place of the plow. With this there is an outer auxiliary blade for cutting the slope to the ditch, and a screw conveyor to carry the excess dirt to the conveyor belt for loading into trucks or wagons. This shouldering attachment can be fitted to machines already in the field.

The outer end of the main blade can be raised or lowered to form the required slope of the shoulders in the same way that the plow is raised or lowered. The inner end also can be raised or lowered when the contour of the pavement or some obstacle makes it necessary. As the top of the blade is 21 inches above the cutting depth and the screws of the conveyor are 5 inches above the cutting edge, a large amount of loose material is carried in front of the blade before the loading begins. This provides enough loose dirt to fill the smaller depressions. The screw conveyor is operated from the same motor on the machine that serves to elevate the load. This permits the operator to stop the machine and continue loading should the dirt pile up. Should a low place need filling, it permits him to stop the screw conveyor while the machine continues to move forward, spreading the material evenly as carried in front of the blade. As the wheels of the machine run on the finished pavement, a smooth cut results at the depth to which the blade has been set. A spirit level on the blade and in constant view enables the operator to regulate the cut with exactness.

The New Western Shouldering Attachment in Use with a No. 6 Elevating Grader

The LaCrosse Tu-Way Trailer Mounted on Pneumatic Tires

A Pneumatic-Tired Trailer

A NEW machinery trailer mounted on pneumatic tires and which can be had in capacities up to 35 tons has been announced by the C. R. Jahn Co., 1140 First National Bank Bldg., Chicago, Ill. It has all the regular features of LaCrosse Tu-Way trailers, in that it is fully reversible and travels in either direction, eliminating turning around at the end of the haul which often speeds up and simplifies loading. Steering is controlled from either end on all wheels so that sharp corners are easily negotiated without swinging out into the traffic. Double end brake control assures safety and brakes are applied to all wheels simultaneously through an equalizing mechanism.

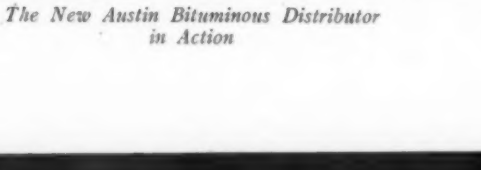
The flat platform permits loading from the front as well as the rear end or from either side and skid ledges are provided. The wheels conform to road conditions through the action of the oscillating axles which also distribute the load evenly over the tires. The tires are changed by the removal of two bearing caps which permit jacking up the trailer body and leaves the wheels ready to be changed by simply rolling out the axle.

Bituminous Distributors for Oil, Tar and Asphalt

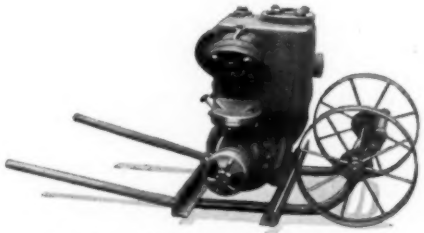
BITUMINOUS distributors built in capacities of 600, 800, 1,000, 1,200 and 1,500 gallons to handle all grades of oil, tar and asphalt and which can be mounted on any standard truck chassis without altering the chassis cross braces, supports, etc., have been announced by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill. Mountings may also be made on trailers and semi-trailers. With this machine any desired uniform quantity of bitumen per square yard may be applied over any specified width. Spray bars, or manifolds, of welded sheet metal construction, are tapered to correspond with the reduction in volume, and to provide proper drainage when they are removed. If preferred, a full circulating boot-type manifold, with individual nozzle shut-offs working in gang formation, can be provided. In the Austin design, nozzles and valve controls are inside the manifold pipe where the heat insures complete and immediate drainage.

The tanks are elliptical in shape to provide an extremely low center of gravity without sacrificing capacity. A full-size manhole with a non-breakable, quick clamping lid and a 2½-inch vertical overflow are standard equipment. Provision for heating includes two large double U-tube flues with generating, non-carbonizing type burners which operate with kerosene or light furnace oil. Before the heat leaves the smokestack at the front, it must also pass through ten smaller flues, spaced to break up the asphalt mass into small volumes. This raises the temperature of the material to any desired point rapidly. The fuel storage and air pressure tanks have sufficient capacity for a day's run.

The pump is of the internal gear type, with but two moving parts, and with a capacity of 350 gallons per minute at 350 rpm. The straight-three pattern with bottom suction and top discharge eliminates objectionable pockets where asphalt would otherwise lodge in heavy quantities. It is driven by a 4-cylinder heavy-duty motor which is placed in front of the distributor to eliminate fire hazards and to prevent the mist and fine spray of asphalt from causing ignition trouble, short circuits and clogging the cooling system. The governor and gas throttle rod controls are extended to the rear, giving the operator complete control of the machine.



The New Austin Bituminous Distributor in Action



The New Domestic Centrifugal Pump

A 2-Inch Self-Priming Pump

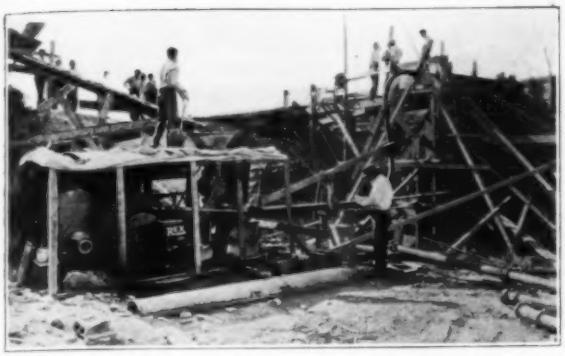
THE new Domestic 2-inch self-priming recirculating-type centrifugal pump, recently announced by the Domestic Engine & Pump Co., Shippensburg, Penna., has a capacity of 10,000 gallons per hour at a 10-foot total head and 3,000 gallons per hour at a 50-foot total head. This pump has all the standard features of the larger sizes of the recirculating-type self-priming units and is equipped with the priming control regulator.

This pump has a wide closed type impeller, 2-horsepower air cooled engine and is mounted on two wheels, in wheelbarrow style, making it easily handled by one man. Its total weight is 410 pounds.

Heavy-Duty Trucks for 1933

A COMPLETE new line of heavy-duty trucks, ranging in size from 2 to 2½-ton four-wheel-drive to the 15-ton six-wheel drive, and incorporating many new improvements, has been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. Special mention is made of three primary models, the H6 of 2-ton capacity for road maintenance; the CU6 of 3½-4-ton capacity for road building and snow removal; and the X6 for petroleum service.

Each of these trucks incorporates the basic four-wheel-drive principle of propulsion and a number of new improvements and refinements which are suitable for their fields of service.



The Pumpcrete Delivering Concrete from Moto-Mixers to Wall Forms

Pumping Concrete to Forms

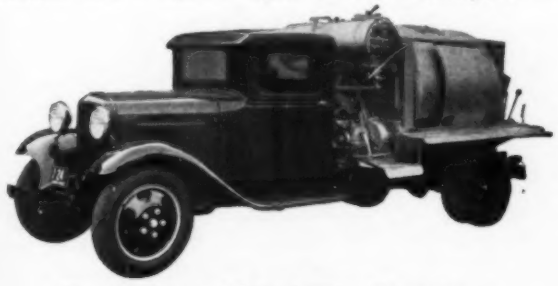
SOMETHING quite new in the way of handling concrete from the mixer to forms was introduced on the 35th Street Viaduct, Milwaukee, Wis., in the Pumpcrete, a new piece of concrete handling equipment just announced by the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., who has the American manufacturing rights for this piece of equipment.

The Pumpcrete is a concrete pump, developed in Europe for delivering concrete to forms by a direct pumping action. It is of the piston type, gasoline or electric motor-driven, with a capacity of 15 to 20 yards of concrete per hour, and is portable. It has transported concrete 500 feet horizontally and up to 72 feet vertically.

The Milwaukee demonstration lasted twelve hours, during which the Pumpcrete handled 125 yards of mixed concrete to the forms, including 1½ hours idle time waiting for delivery. The concrete of the standard mix used on the project was delivered in Moto-Mixers to the hopper of the pump. The concrete, as delivered to the forms, was rigidly inspected and approved.

A 1½-Yard Mixer for Light-Duty Trucks

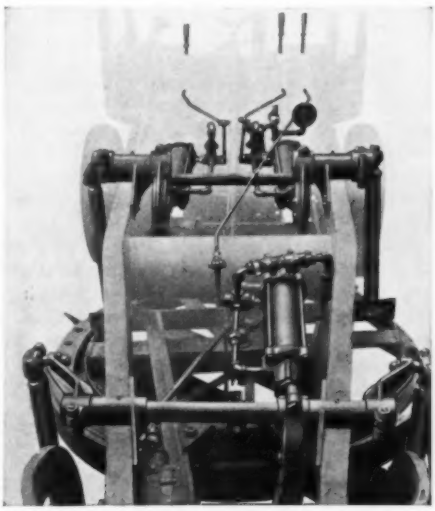
A HIGHER speed truck mixer for mounting on 1932 Ford trucks or other light-duty trucks of similar specifications has recently been announced by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio. This mixer is capable of mixing in transit 1½ yards of concrete or can be used as a 2-yard agitator. It is designed of structural steel parts so as to secure greater strength with less weight, thereby providing the possibility of greater payload. The unit is equipped with spiral mixing blades, giving the Dual-Mix action which is a feature of all Jaeger truck mixers. It is also equipped with a separate engine drive, a 10-horsepower 4-cylinder radiator-cooled engine with starter for hook-up to the truck battery for furnishing power direct to the drum. Standard equipment includes a 6-foot aluminum chute for easy handling, controls for the throttle and full control of the drum grouped at the discharge end of the machine as well as at the engine end. The entire assembly is mounted on skids or a main frame so that the unit is readily assembled to the truck chassis.



The 1932 Jaeger 1½-Yard Mixer Mounted on a Ford Truck

Motor Graders with Hydraulic Power Control

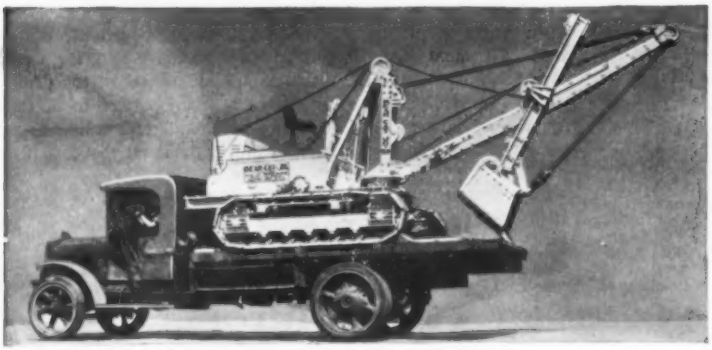
A POWER grader is an important machine both in highway construction and maintenance. The Galion Iron Works & Mfg. Co., Galion, Ohio, has developed a hydraulically-controlled motor grader for contractors' use in preparing the grade for hard surface roads and for the use of city, county and state highway departments for the maintenance of earth and gravel roads. The Galion patrol grader is built with a heavy, 10-inch channel frame, cross-braced with large diameter pipes, electric-welded at the ends. It is further braced by a heavy built-up gear case supporting the bracket, the motor, the side shift bracket, the radius rod support and the cast head block, insuring rigidity under working conditions. The grader bottom is built with unusual strength and the drawbars are made of heavy angle iron thoroughly braced and reinforced with all parts welded into one piece. The circle, also of welded construction, is built of high tensile steel. The moldboard is of high carbon steel plate formed with an extra deep curve and attachment to the circle is by means of cone bearings which are adjustable for wear.



The Hydraulic Control of the New Galion Motor Grader

The connections to the lifting device are by ball and socket which also are adjustable for wear. A replaceable ball stud is used in this joint. The connections for the drawbar circle and moldboard are so made as to eliminate any tendency to chatter. The moldboard and blade are supplied in 8, 10, 12, 14 and 16-foot lengths.

The hydraulic control eliminates the need of spinning wheels and turning cranks. All adjustments of the moldboard and scarifier are controlled by three easy-moving levers conveniently located which reduce the operation to a single task. These graders are offered with McCormick, Cletrac or Case tractor power.



A New Convertible ⅜-Yard Shovel

New Small Shovel Can Be Moved on Truck

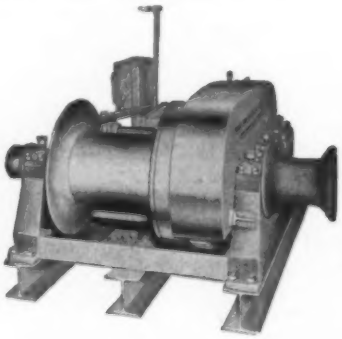
A NEW ⅜-yard convertible shovel which is light enough to mount and transport on a heavy-duty motor truck has been announced by The Bearcat Shovel Works, a division of The Byers Machine Co., Ravenna, Ohio. This Bear Cat Jr. weighs 6½ tons complete as a shovel. The light total weight is practical chiefly because of the balance of the machinery which eliminates the dead counterweight, and its simple construction which allows all parts to be rugged, and its freedom from crawler mechanism beneath the deck.

All operations of traveling, steering from both crawlers, swinging, independent crowding and hoisting are accomplished through only three operating shaft assemblies on the fully enclosed machinery deck. There are no shafts below the main frame. A 3-speed transmission between the motor and take-off gear provides three travel speeds and two operating speeds for ordinary and light digging. The gear-driven swinger can be positively locked to prevent swinging while traveling. The motor is a 4-cylinder slow-speed industrial type developing 30 horsepower and using 10 gallons of gas per day in steady digging.

The manufacturer states that the purpose behind the development of the Bear Cat Jr., was to produce a dependable shovel and crane incorporating the latest engineering developments and efficiencies at a lower purchase price with lower operating and maintenance costs.

A Combination Drum and Capstan Car-Puller

A DRUM and capstan car-puller for spotting a train of loaded railroad cars in either direction and at low rope speed has simplified the handling of cars at the batching plant or in the yards of permanently located ready-mixed concrete plants. In particular where one man has complete control of all car placements, the Fridy drum and capstan car-puller made by the Fridy Hoist & Machinery Co., Mountville, Pa., is adaptable. A steel cable is used on the drum for handling a haul of 900 feet and under, and for shorter pulls of less than 300 feet, the horizontal capstan is used with manilla rope.



The Fridy Combination Drum and Capstan Car-Puller

This new type of car-puller is furnished in 10, 15 and 20 horsepower motor ratings, for handling a train of 500 tons and under on a slight grade. The special features embodied are a double cone V-shaped friction clutch, asbestos lined, and with an improved type screw thrust assuring a positive grip and release of the drum by a slight movement of the operating lever. This protects both the motor and the mechanical construction of the car-puller against excessive strains and shocks when pulling a heavy load. The triple spur gear drive is of steel and enclosed in an iron housing. The main operating lever, motor control switch and foot brake are all located within easy reach of the operator. The complete unit is mounted on a steel I-beam sub-base or can be made portable, depending on the service in which it is to be used.

Barrels for Batching and Handling Cement

CONTRACTORS have been quick to note the advantages of bulk cement in road construction and other concrete work. A system of bulk cement handling which is inexpensive and effective has been developed by the Stevens Metal Products Co., Niles, Ohio. This system involves the use of a Batch-barrel, built similar to oil drums in capacities of 6, 7 and 8½ sacks and measuring 32, 36 and 42 inches high and 23¾ inches in diameter for all sizes, and a hand truck or Wheelbatcher.

The batch-barrels weigh from 50 to 60 pounds each and are equipped with weather-proof lids that clamp on. The wheelbarrow picks up the barrels after they are loaded in the car and conveys them to a platform scale where the quantity of cement is checked. They are then wheeled over chutes placed in the batching platform where the cement is discharged into the batch trucks by revolving the barrels in the wheelbatchers. Trunnions placed in the sides of the barrels engage sockets in the wheelbatcher when they are picked up. The barrel turns on these trunnions when discharged. The trunnions are placed in depressions so that the barrels can be rolled when empty. The wheelbatchers are equipped with 28-inch diameter wheels, have an overall width of 36 inches and weigh 160 pounds. A supply of loaded batch-barrels can be kept on the batching platform to bridge over delays such as occur when cars are being shifted or they can be loaded on flat bed trucks and transported to points remote from the railroad siding.

Attachment for Welding Torch

A NEW cutting assembly or attachment for a welding torch, called the Money Saver cutting assembly, has recently been developed by the Smith Welding Equipment Corp., 2619-33 Fourth St., S. E., Minneapolis, Minn. Simplicity is the outstanding feature in the design of this new assembly.

The cutting oxygen valve is a triple thread, screw valve with knurled thumb wheel, so arranged that it can be quickly opened and closed with the thumb. The valve forging has been reduced to the simplest possible design, the cutting tip automatically evening up the flames. All parts not absolutely essential to operation have been eliminated. This assembly has been approved by the Underwriters' Laboratories.

The New Mounting of the Bucyrus-Erie 52-B Dragline

A New Oversize Crawler Mounting for Gas and Diesel Draglines

A NEW oversize crawler mounting for the Bucyrus-Erie 52-B gas and diesel dragline has been announced by Bucyrus-Erie Co., South Milwaukee, Wis. This new mounting is extra long, providing greater stability when the dragline operates on soft bottom, is extra wide and can be furnished with 36 or 42-inch wide links to give greater bearing area.

Other features are the liberal clearance under the truck frames, mud guards to protect the simple driving machinery, large rollers and Bucyrus-Erie crawler links to prevent clogging. Easy steering is controlled from the operator's position on the deck. The ends of the two crawler belts are tapered to facilitate going through soft places. These features, according to the manufacturer, make this machine particularly adaptable for levee and irrigation work. The overall length is 21 feet 2 inches, the overall width, 13 feet 6 inches and the bearing area, 122.5 square feet.

The 52-B dragline to which this mounting applies handles a 1½-yard heavy-type Bucyrus-Erie drag bucket on a 75-foot boom or other combinations to suit the special requirements of the job.

All-Wheel-Drive Motor Trucks

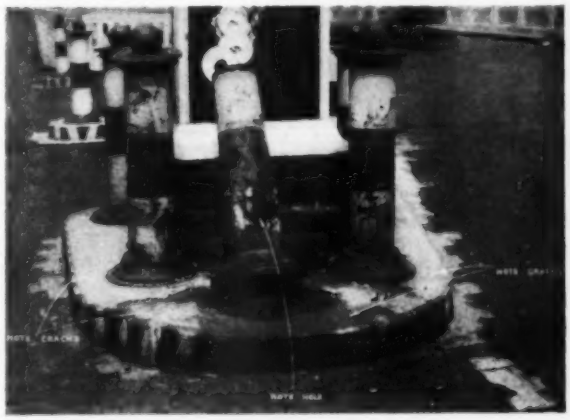
DELIVERY has been made to the Indiana State Highway Department of three new Marmon-Herrington all-wheel-drive motor trucks. These units, which have been equipped with 3-cubic yard dump bodies, will be used in various parts of the state for highway maintenance and for snow removal, when necessary.

These trucks, which are known as Marmon-Herrington Model T H-300-4, have a rated capacity of 3½ to 4 tons each. Drive is through both front and rear wheels which is one of the features of these trucks, and the rear wheels are of the dual type. The trucks are powered by six-cylinder 04-horsepower engines, each with a piston displacement of 428 cubic inches. Other features are Westinghouse air brakes and standard and auxiliary transmissions giving a total of ten speeds forward and four reverse. These trucks are manufactured by the Marmon-Herrington Co., Indianapolis, Ind.

Three Marmon-Herrington All-Wheel-Drive Trucks Delivered to the Indiana State Highway Department

Protecting Concrete from Impact

STREET curbs, steps, loading platforms, columns and doorways are subjected to many impacts from the rims of truck wheels. To save concrete in these places from spalling Armored Concrete has been developed. This system, which is sold by B. Nicoll & Co., Inc., 292 Madison Ave., New York, N. Y., is a construction composed of concrete and grey cast iron. To the body of concrete which forms its mass is bonded a surface or veneer of grey cast iron. The method of bonding is such that the two diverse materials became a mechanical unit. The resultant basic characteristic of the construction is its ability to withstand damage under the heaviest impacts. It withstands abrasion, corrosion and temperature and moisture variations, as demonstrated by its use through the last seven years.



A Safety Island on New Jersey Route 25 West of the Holland Tunnel, Where the Base Was Built of Armored Concrete, and the Bond Was Not Shattered When a Truck Hit the Island Head-On

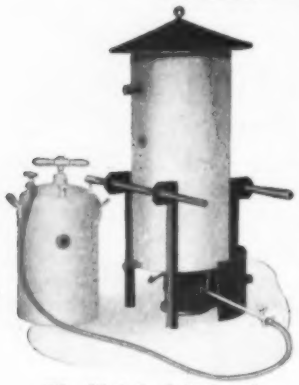
Addition to Line of Centrifugal Pumps

THE addition of a 2-inch self-priming centrifugal pump to its line of centrifugals has recently been announced by the Novo Engine Co., 216 Porter St., Lansing, Mich. This new pump has a capacity of 7,500 gph at a 15-foot lift and a total head of 55 feet.

One of the new features of this pump is the exclusive leather seal which is used instead of packing. According to the manufacturer, this seal requires no attention, and is air and water-tight at all times. The self-priming action is positive, performed by the recirculating method. The unit-built design gives compactness and the pump housing is bolted directly to the engine block. The outfit is completely equipped with anti-friction bearings, the 2-horsepower engine operates on Timken roller bearings and the pump impeller shaft on New Departure ball bearings.

The outfit is mounted on a handy two-wheel truck and is also furnished on a rubber-tired spring-mounted trailer or without the truck on skids. The standard truck outfit weighs 340 pounds. The unit without the truck is 24⅝ inches long, 17 inches wide and 29⅝ inches high.

An Oil-Burning Jacketed Water Heater



The Littleford Jacketed Water Heater

WITH cold days immediately ahead, contractors are going to need hot water for their mixers. Littleford Brothers, 485 E. Pearl St., Cincinnati, Ohio, has an outfit which produces 300 gallons of water per hour at 175 degrees Fahrenheit. This oil-burning water heater has a double wall which forms a jacket of water around the coils. When this jacket is filled, water enters the inner coil and flows downward, and then rises through the outer coil and passes out again at the top as hot water. The water passes in close contact to the Littleford circular burner three times, once in the jacket where it is preheated, again when it passes through the inner coils and finally in the outer coil. The water jacket acts as an insulator against outside temperature, thereby permitting the water to absorb all available heat.

Additions to Truck Line

CONTINUING the policy of improvement and enlargement of its truck line, Reo Motor Car Co., Lansing, Mich., recently announced two new models, a 6-cylinder Gold Crown engine 2-ton model, and a new 8-cylinder 4-ton truck. Each of these new trucks has many new and distinctive long-life and performance features, according to the manufacturer. A complete line of Reo-built cabs and bodies, covering every need, both standard and special, and tractor-trailer units ranging up to 32,000 pounds gross are supplied with these new chassis.

A 9-Yard Carry-All Scraper

A NEW 9-yard scraper which is designed to pick up a large load and carry it in high gear has been announced by R. G. LeTourneau, Inc., Wilson Way and Roosevelt Ave., Stockton, Calif. This carry-all scraper is so built that the end gate, which hangs forward and up from the bucket, forces the earth which is in front of the blade when partly loaded, into the scraper. This end gate, actuated by a cable from the LeTourneau power control unit, forces all the earth into the bucket so the scraper can be raised and the load carried away in high gear. The load is discharged by forcing the end gate to the rear while moving.

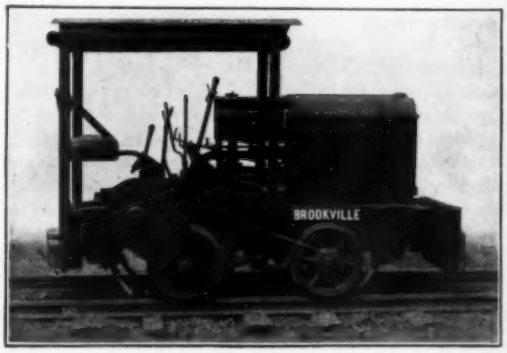
The LeTourneau 9-Yard High Gear Scraper

The LeTourneau scraper is made of all-welded steel construction. Its average capacity is 9 cubic yards, and requires 60 to 75-horsepower tractor power. The cutting blade is 5/8 x 8 inches x 10 feet, the bowl bottom is 7 x 10 feet and the height of the bowl sides is 48 inches.

A New Series of Industrial Locomotives

A NEW series of industrial locomotives in standard gages and in 4, 5, 6, and 7 tons weight has been announced by the Brookville Locomotive Co., Brookville, Pa. The speed range of the B-I-30 series in both forward and reverse is from 2 to 15 miles per hour with engine power above the average used in locomotives of these weights.

The power unit is the new L-30 McCormick-Deering industrial tractor. The locomotive features have been held to essentials in order to maintain lower prices, and include a heavy unbreakable steel frame, sanders, dual brakes, dual spring journal boxes, etc. Brookville steel tired drive wheels are standard equipment.



One of a New Series of Industrial Locomotives

Improved Gas Engines

AN improved line of vertical 4-cylinder gas engines covering a wide power range in a variety of cylinder combinations has recently been announced by the Worthington Pump & Machinery Corp., Harrison, N. J. These units are built with one to eight cylinders and 30 to 150 horsepower per cylinder, thus meeting all power requirements from 30 to 1,800 horsepower. Some of the more interesting details of construction incorporated in these engines are: a mixing valve common to all cylinders and adjustable through a single knurled handscrew is employed on all but the largest units; separate air and gas mixing valves, independently adjustable for each cylinder, are installed in each cylinder head of the largest engines; in all but the smallest units air inlet and exhaust valves are carried in removable and interchangeable cages, the exhaust valve cages being water cooled; in the smaller engines these valves, also interchangeable and adjustable, seat directly in the cylinder head and operate in removable bushings.

An attached reciprocating pump circulates lubricating oil through a cast-in duct in the base with cast-in branches leading to the bottom of each main bearing. Through drilled passages in the crankshaft and connecting rods, the oil reaches the crank and wristpin bearings under pressure from the main bearings. Two-point force feed lubrication of the cylinders is employed on all but the smallest units.

These engines can be readily converted to diesels at moderate expense. Dual pumps and spray valves replace the magneto or battery and spark plugs. The mixing valves are omitted and diesel cylinders with smaller valves in the heads are substituted.